



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

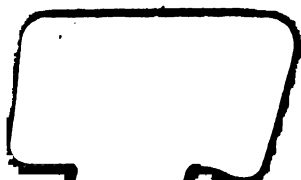
Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

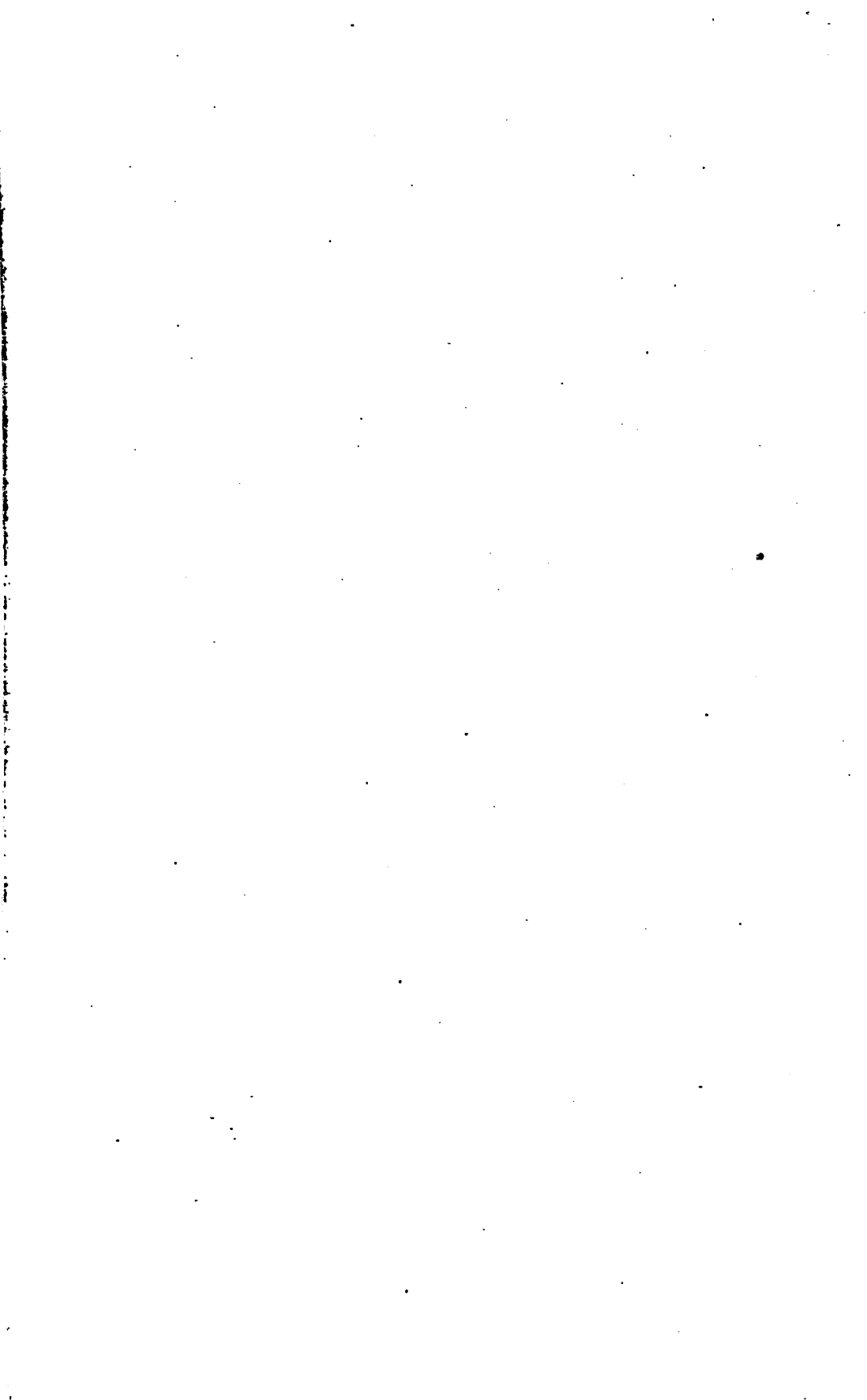
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

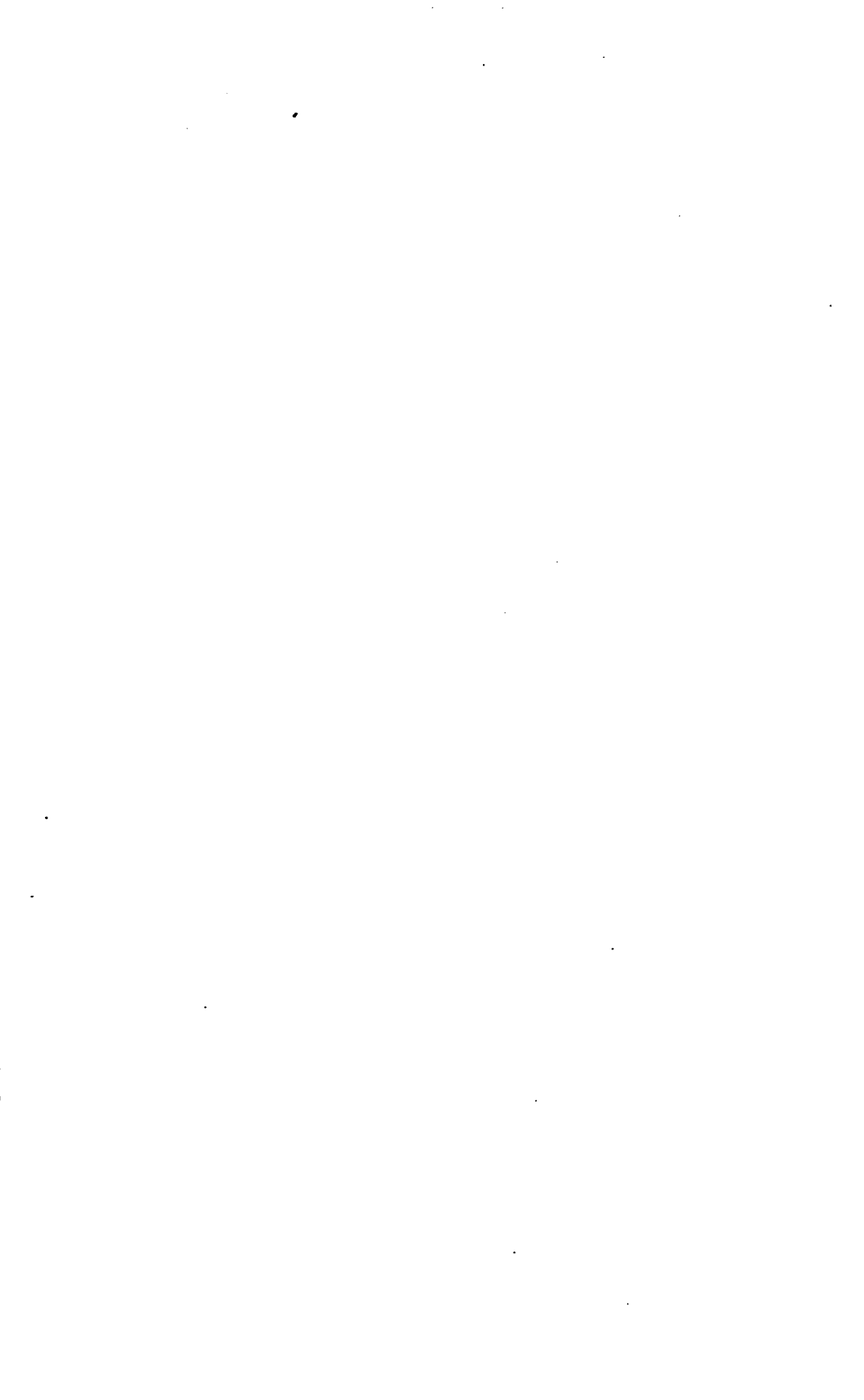
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>











CONTRIBUTORS TO VOLUME II.

CLARK, JOHN G., M.D.

COLEY, WILLIAM B., M.D.

JACKSON, EDWARD, M.D.

STENGEL, ALFRED, M.D.

PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

EDITED BY

HOBART AMORY HARE, M.D.,

PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA; PHYSICIAN TO THE JEFFERSON MEDICAL COLLEGE HOSPITAL; LAUREATE OF THE ROYAL ACADEMY OF MEDICINE IN BELGIUM, OF THE MEDICAL SOCIETY OF LONDON; CORRESPONDING FELLOW OF THE SOCIEDAD ESPAÑOLA DE HIGIENE OF MADRID; MEMBER OF THE ASSOCIATION OF AMERICAN PHYSICIANS, ETC.

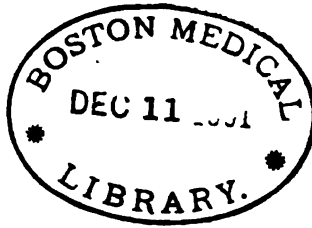
VOLUME II. JUNE, 1899.

SURGERY OF THE ABDOMEN, INCLUDING. HERNIA—GYNECOLOGY—
DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DIS-
ORDERS. DISEASES OF THE SPLEEN, THYROID GLAND,
AND LYMPHATIC SYSTEM—OPHTHALMOLOGY.



LEA BROTHERS & CO.,
PHILADELPHIA AND NEW YORK.

1899.



2535

Entered according to the Act of Congress in the year 1899, by

LEA BROTHERS & CO.,

In the Office of the Librarian of Congress. All rights reserved.



DORNAN, PRINTER.

LIST OF CONTRIBUTORS.

HENRY B. BAKER, M.D.,

Michigan State Board of Health, Lansing, Mich.

WILLIAM T. BELFIELD, M.D.,

Associate Professor of Surgery in the Rush Medical College; Professor of Surgery in the Chicago Polyclinic, Chicago.

ALEXANDER D. BLACKADER, M.D.,

Professor of Pharmacology and Therapeutics and Lecturer on Diseases of Children in the McGill University, Montreal, Canada.

JOSEPH C. BLOODGOOD, M.D.,

Associate in Surgery in the Johns Hopkins University; Assistant Surgeon to the Johns Hopkins Hospital, Baltimore, Md.

JOHN ROSE BRADFORD, M.D., F.R.C.P.,

Professor of Materia Medica and Therapeutics in the University College, London; and Professor-Superintendent of the Brown Institution.

ALBERT P. BRUBAKER, M.D.,

Adjunct Professor of Physiology and Hygiene in the Jefferson Medical College Philadelphia.

JOHN G. CLARK, M.D.,

Associate in Gynecology at the Johns Hopkins Hospital, Baltimore, Md.

WILLIAM B. COLEY, M.D.,

Clinical Lecturer on Surgery in the College of Physicians and Surgeons, New York, and Assistant Surgeon to the Hospital for the Ruptured and Crippled.

J. CHALMERS DA COSTA, M.D.,

Clinical Professor of Surgery in the Jefferson Medical College, Philadelphia.

WILLIAM EWART, M.D., F.R.C.P.,

Physician to and Joint Lecturer on Medicine at St. George's Hospital and Physician to the Belgrave Hospital for Children, London.

FREDERIC H. GERRISH, M.D.,

Professor of Anatomy in the Medical School of Maine, Portland, Me.

LUDVIG HEKTOEN, M.D.,

Professor of Pathology in the Rush Medical College, Chicago.

EDWARD JACKSON, M.D.,

Emeritus Professor of Ophthalmology in the Philadelphia Polyclinic.

RICHARD C. NORRIS, M.D.,

Instructor in Obstetrics in the University of Pennsylvania, Philadelphia; Physician-in-charge of Preston Retreat.

ROBERT L. RANDOLPH, M.D.,

Associate in Ophthalmology and Otology in the Johns Hopkins University, Baltimore, Md.

WILLIAM G. SPILLER, M.D.,

Professor of Diseases of the Nervous System in the Philadelphia Polyclinic, Philadelphia.

HENRY W. STELWAGON, M.D.,

Clinical Professor of Diseases of the Skin in the Jefferson Medical College, Philadelphia.

ALFRED STENGEL, M.D.,

Instructor in Clinical Medicine in the University of Pennsylvania, Philadelphia.

CHARLES G. STOCKTON, M.D.,

Professor of the Practice of Medicine and Clinical Medicine in the University of Buffalo, Buffalo, N. Y.

WILLIAM SYDNEY THAYER, M.D.,

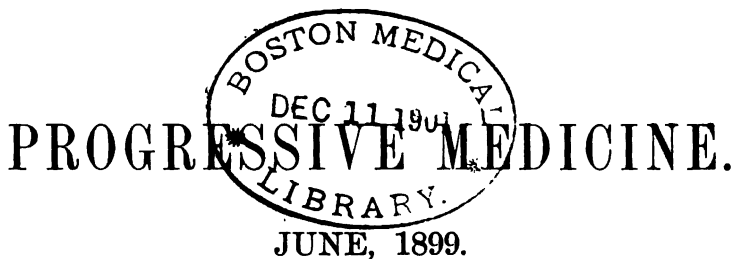
Associate Professor of Medicine in the Johns Hopkins University, Baltimore, Md.

A. LOGAN TURNER, M.D. (EDIN.), F.R.C.S. EDINBURGH,

Surgeon for Diseases of the Ear and Throat to the Deaconess Hospital; Assistant to the Lecturer on Laryngology in the University of Edinburgh.

CONTENTS OF VOLUME II.

SURGERY OF THE ABDOMEN, INCLUDING HERNIA	17
By WILLIAM B. COLEY, M.D.	
GYNECOLOGY	141
By JOHN G. CLARK, M.D.	
DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DIS- ORDERS. DISEASES OF THE SPLEEN, THYROID GLAND, AND LYMPHATIC SYSTEM	249
By ALFRED STENGEL, M.D.	
OPHTHALMOLOGY	367
By EDWARD JACKSON, M.D.	
INDEX	457



SURGERY OF THE ABDOMEN, INCLUDING HERNIA.

By WILLIAM B. COLEY, M.D.

SURGERY OF THE ABDOMINAL CAVITY.

The Use of Drainage in Abdominal Surgery. The question of employing drainage in abdominal wounds is one of considerable importance, and at the present time there is little unanimity of opinion among surgeons as to what extent it should be used. During the last ten years there has been a gradual tendency in the direction of limiting drainage to those cases in which infection was known to be present. There are some, however, who would even go further, having such faith in the powers of absorption of the peritoneum as to abandon drainage in the majority of infected cases.

As a most able exponent of this latter class should be mentioned J. G. Clark, Associate in Gynecology at the Johns Hopkins University. In the *Johns Hopkins Hospital Reports*, May, 1898, Clark has made a critical analysis of 1700 cases of abdominal section from the standpoint of intraperitoneal drainage. He states that 73 per cent. of the first hundred cases were drained by means of glass tubes. Bacteriological examination of the drainage-tubes showed them to be non-sterile in a large proportion of cases. Of the second and third hundred cases 57 per cent. and 48 per cent. respectively were drained. In the fourth hundred only seven cases were drained, three by means of glass tubes, and four with gauze. Of the sixth hundred, which marked the introduction of the Mikulicz gauze bag, 33 per cent. were drained. It was at about this period that Dr. Kelly began to study bacteriologically the character of the fluids in the abdominal cavity at the time of the operation, by cover-glass preparations, adopting the principle of draining only those cases in which cultures were found. This caused him to drain a larger proportion of the cases in the thirteenth and fourteenth hundred of cases.

At this time Clark and Miller began a bacteriological study of the drains themselves, with the result that, notwithstanding the fact that the fluids at the time of operation may have been sterile, the drains themselves were nearly always found contaminated at the first dressing. Clark gives a careful résumé of the experimental work of Grawitz, Halsted, and others, proving the enormous power of absorption of the normal peritoneum. His experiments show that both fluids and solids may pass through the endothelial layer of the peritoneum, although the solids can only find their way through the spaces in the diaphragm. Very large quantities may be absorbed in a short time. The liquids are largely the carriers of the foreign bodies from the various parts of the abdominal cavity into the mediastinal lymph-glands.

It is stated that normally there is a force in the peritoneal cavity which carries fluids and foreign bodies toward the diaphragm. Wagner's experiments show that a comparatively large quantity of infected matter may be disposed of by the normal peritoneum. Grawitz's experiments show that pus-producing organisms may result in a purulent peritonitis under the following conditions :

- a. If the culture fluid is difficult of absorption.
- b. If irritating material is present which destroys the tissues of the peritoneum, thereby producing lodgement for the organisms.
- c. A purulent peritonitis will certainly be developed if a wound in the abdominal wall is present which forms a nidus for an infectious process.

Halsted's experiments are quoted as showing that while the normal peritoneum may successfully dispose of infectious micro-organisms introduced alone, it is less likely to do so if these organisms are introduced in connection with a foreign body, even though the latter be sterile. For example, cultures of the staphylococcus aureus, if introduced into the peritoneal cavity, fail to produce peritonitis, but if introduced on a piece of sterile potato always do so.

Clark's objections to the use of the drain may be summed up as follows :

1. The drain produces traumatic and chemical irritation.
2. It delays wound healing.
3. It is not effectual.

The artificial effort to remove material from the abdominal cavity by means of a drain, Clark regards as about as effectual, compared with the absorptive ability of the peritoneum, as a tiny brook compared to a great river in draining a lake. He states that the drain handicaps the peritoneum in three ways :

1. By disturbing the normal currents of the peritoneum.
2. By setting up an inflammatory action about the drain.
3. By causing the formation of a wall of adhesions about the drain

within a few hours, thus cutting off the general peritoneum from all participation in the work of absorption.

Clark regards the cases requiring drainage as extremely limited in number. He states that operations during the acute stage of pelvic inflammation are very dangerous and are rarely necessary. Out of 4500 gynecological cases at the Johns Hopkins Hospital, only one death was recorded from peritonitis following rupture of a pelvic abscess. He admits that it may be necessary to operate in a large proportion of cases in the acute stage of appendicitis, and in many of these it might be impossible to do without the drain. He gives an analysis of sixteen cases of gauze drains examined bacteriologically in the upper, middle, and lower portions. In all instances some parts of the drain showed the presence of some variety of micro-organisms, while, the author states, every one of the cavities drained showed the absence of cultures. It should be noted that four of the cases were operations for appendicitis, one for purulent peritonitis, four for pelvic abscess, one for tuberculous kidney. Hence, while a hasty cover-glass examination made at the time of the operation may be negative, it is easy to understand how the drain in contact with far larger surfaces for hours and days might be infected from within rather than from without. As a matter of fact, in five out of six of the clean cases the middle and lower portion of the drain proved sterile, while in the others this was not the case. From these experiments Clark concludes that a gauze drain will almost invariably become contaminated from without, the variety and virulence of the organisms depending upon the cleanliness of the surrounding skin and, to some extent, upon the purity of the air.

If we study these cases reported by Clark, from a clinical stand-point, we find that of the six non-inflammatory cases every one healed rapidly with the single exception of a cyst of the ovary with hydrosalpinx. In other words, the clinical results were practically perfect, notwithstanding the fact that the outer portion of the drain showed the presence of micro-organisms. In the cases of inflammatory origin there were some with delayed wound healing; yet it is hardly fair to attribute this entirely to the drain, for had no drain been used in these cases of peritonitis, appendicitis, and pelvic abscess, it is possible the author would have had to report something far more serious than delayed union. Clark states that in 100 undrained cases in which more or less extensive adhesions were present at the time of operation, only one was followed by pelvic abscess, while in 100 similar cases in which the drain was employed, pelvic abscess resulted eight times. Unless these were consecutive cases (and it is not so stated) the presumption is that the hundred cases treated by drainage were the more serious cases with more extensive adhesions. If this be true, the comparison loses its value.

Clark believes that the introduction of a gauze drain into a raw and bleeding cavity, while it may check oozing, will invariably induce free serous discharge, which he regards as quite as dangerous, when it degenerates and becomes infected, as an infected blood-clot.

In regard to dangers associated with abdominal and vaginal drainage, he considers them as about equal.

Clark would limit the use of drainage to certain cases of purulent peritonitis, though he states that Finney has reported five cases successfully treated by thorough mopping out of the pus and exudate by means of gauze sponges, proving that even in these cases the drain is not always necessary. Finney in his paper on "Perforating Typhoid Ulcer" expresses himself as follows: "Drainage should always be employed. True, a case now and then will recover without it. That the peritoneum is able to take care of a certain amount of infectious material has been abundantly proved, but it is best not to overtax its powers." In purulent peritonitis Clark advises irrigation and free gauze drainage. After resection of the intestines he would only drain in cases in which there was doubt as to the integrity of the suture.

Dr. Lewis A. Stimson in his valuable paper on "Results and Methods of Surgical Operations" at the New York Hospital,² in referring to abdominal drainage, says: "This temporary gauze drain has been used in all cases except the hysterectomies in which there has been vaginal drainage. It may do no good in the clean cases, but it certainly does no harm, for the 'waiting ligature' insures a prompt and as complete union as if the wound had been previously closed throughout, and it saves the peritoneum from the necessity of taking up the serous discharge, and provides an invaluable safeguard if infection should chance to be present."

The most recent and authoritative opinion as to this question of drainage in intra-abdominal operations is that of Dr. Frank Hartley, given in a paper upon "Ulcer of the Stomach."³ His opinion as to the value of drainage is so thoroughly in accord with my own that I shall give it somewhat in detail. He states that no matter how much we may rely on our antisepsis preparatory to operations and on our asepsis during operation, we are not yet able to exclude microbic infection in all cases of simple wounds of the abdominal wall healing by first intention.

"*Staphylococcus albus* and even *aureus*, in a certain number of cases, are found in these wounds in spite of our best efforts. They do not always produce sepsis, pus or fever, simply because the cultures in the skin most frequently derived from the air are of slight virulence, and because of the bactericidal properties of the wound secretion.

¹ *Annals of Surgery*, 1897, vol. xxv.

² *Ibid.*, 1896, vol. xxiii.

³ *Medical Record*, February 11, 1899.

“If we cannot accomplish such a condition in favorable situations, how much less are we able to accomplish it in an already infected area. We are never certain of having removed all infection; we certainly leave enough for the peritoneal resorption even when drainage is used. I cannot bring myself to believe that the abdominal wounds in these cases should be sewed up and the patient placed in a slight Trendelenburg posture to favor absorption. I think the peritoneum has as much as it can do to take care of what we leave behind without our imposing further burdens upon it.”

The Use of Rubber Gloves in Abdominal Surgery. During the past year the use of rubber gloves in operative surgery has become very general. The advantages of the gloves are very clearly set forth by Dr. Charles McBurney.¹ He states that since the middle of October, 1897, he, as well as all of his assistants, have worn rubber gloves at every operation of any kind in their daily service—one of great activity. The results have been most satisfactory.

The list included a great variety, such as operations for gallstones, hernia, nephrectomy, appendicitis, cleft palate, and thyroidectomy. All of the cases operated upon both in hospital and private practice from October, 1897, to March, 1898, were carefully observed in order to detect the slightest infection. No solutions, with the exception of sterile salt solution, were used or came in contact with the wound. The hands were merely washed in soap-water before the gloves were put on. In five cases only were there any traces of infection, and in these infection was very trifling, a single drop of pus at one suture puncture being found at the second change of dressing in one case; in another, a child from whom a tuberculous gland had been removed, a small quantity of serum escaped on the fifth day, which later became slightly turbid. In a further case in which laparotomy and intestinal anastomosis had been performed for a discharging artificial anus, there was a needle abscess without rise of temperature. All of the wounds healed primarily, and in no one did any part of the suture line give way. McBurney states that in judging of these results he has used the highest clinical standard with which he is acquainted, and he has never before seen such uniformly perfect wound healing. After this experience, he states, he feels justified in saying that “no change of methods has ever been so completely and delightfully satisfactory as the use of India-rubber gloves while operating.”

Among the advantages connected with the use of the gloves, McBurney states that the sense of touch is not blunted; one can feel a very feeble pulse while wearing a well-fitting rubber glove. The same is true of adhesions, slight differences of consistency and irregularities. He

¹ *Annals of Surgery*, July, 1898.

believes that in a sense the touch is rendered more acute by the use of the gloves, for the reason that the hands of the operator who wears gloves never become hard and callous or roughened by the continued irritation of disinfectants. The gloves are boiled for half an hour in a 1 per cent. solution of soda, and then washed off in sterile salt solution. Operators, assistants, and nurses put on a fresh pair of gloves for every operation, and this, he believes to be very important. The best way of putting on the gloves is to fill them with the sterile salt solution and to then introduce the hand while they are so filled.

Personally, the writer has not had a very extensive experience with the use of the rubber gloves in abdominal surgery. I believe, however, that the advantages set forth by McBurney are real, and that a more general use of gloves will be attended by great improvement in results. For delicate operations, such as separating the sac from the cord in radical cure of hernia, especially in children, I believe that very thin rubber coats may with advantage be substituted for the glove in the case of the operator himself, all the assistants wearing gloves.

Abdominal Incisions. Woolsey¹ discusses the advantages and disadvantages of the various abdominal incisions at present employed. He states that the older and even now existing methods of incision do not give universal satisfaction, as is evinced by the many new procedures suggested. In every incision the requisites, according to Kocher, are free access and the avoidance of large vessels and nerves. In abdominal incisions there is another important consideration, namely, the possibility of a ventral hernia following the incision. Ventral hernia is much more common as a result of incisions of the lower half of the abdomen. It is important to remember that aponeurosis is less resistant than muscle, for this has an important bearing on the question of choice of incisions. Up to a very recent date, in nearly all operations upon the abdomen the incision was made either in the *linea alba* or the *linea semilunaris*. In operations for appendicitis, Woolsey points out, the vertical incision at the semilunaris line is objectionable, first, because it divides the tenth, eleventh and twelfth dorsal nerves, which supply the rectus muscle, thereby weakening it and the abdominal wall; second, because in healing it furnishes a cicatrix almost entirely fibrous and, hence, thinner and weaker than one containing both muscle and fibrous tissue.

Kocher advocates vertical incision of the superficial layer of the sheath of the rectus muscle, about 1 to 2.5 cm. from its outer border, the retraction of the intact muscle inward and the division of the posterior layer of the sheath in very nearly the same line as the incision in the superficial layer. This gives fairly free access to the appendix when it is in its usual position, but it can with difficulty be made without

¹ *Annals of Surgery*, January, 1898.

dividing the nerves mentioned. The oblique incision, chiefly used, has at present largely supplanted the vertical incision. If the method suggested by McBurney, of separating the muscular fibres rather than cutting them, be adopted, the chances for a subsequent ventral hernia are greatly reduced. In this incision the nerves remain uninjured, for the reason that the muscular fibres of the external oblique and transversalis muscle are very nearly parallel with their direction. This incision is especially adapted to operations for appendicitis during the interval or in the quiescent stage.

In regard to incisions in the upper part of the abdomen in operations upon the biliary tract, various incisions have been proposed by different surgeons. The vertical incision along the outer border of the rectus muscle, as well as the transverse incision, while furnishing free access, is objectionable, for the reason that the eighth, ninth, and tenth dorsal nerves are cut. The method advocated by Woolsey is a vertical median incision with a transverse cut at the level of the umbilicus. He states that the obliquely transverse incision below the costal margin gives roomy approach to the same region while it also follows the cleavage lines of the skin and the intercostal nerves. If greater space is desired, the incision may be prolonged vertically on the semilunar line.

Ramsey,¹ an English surgeon, has pointed out the disadvantages of the median incision for general abdominal operations, as compared with incisions through muscular tissue, and he has proposed as a substitute the vertical incision through the middle of either rectus muscle. The advantages of this incision he believes to be :

1. That the vascularity of the parts favors rapid and efficient healing.
2. The muscle is not injured by the separation of its fibres.
3. The umbilicus is not in the way.
4. It gives as ready access to all the parts as an incision at the median line.
5. When the wound is united in several layers the scar is deep and firm, but the most important of all is, that the wound, if properly closed, greatly reduces the liability to hernia.

The opinion of Ramsey as to the advantages of the lateral over the median incision, I believe to be correct, and the lateral incision is fast superseding the median.

Woolsey's conclusions are :

1. That abdominal incisions, except those close to the median line, should be obliquely transverse in order to parallel the nerves.
2. That intramuscular or transmuscular incisions even, should be preferred to those in the linea alba or semilunaris.
3. That in place of the median vertical incision the intermuscular

¹ Lancet, November 30, 1895.

incision, near or between the border of the rectus, offers many important advantages.

The Treatment of Intestinal Paralysis and Peritonitis by Enterostomy. The late Dr. W. W. Van Arsdale,¹ of New York, advocated enterostomy in cases of general peritonitis accompanied by marked paresis of the intestine. He stated that judging from published reports as well as from personal observations, a larger number of cases of acute general peritonitis actually recover than one would be led to suppose from modern text-books. Whether these recoveries are due to the character of the infection, to the individual resistance of the patients or to the methods of treatment, is by no means clear. He stated that in thirteen consecutive cases of acute general peritonitis which he had recently reported, one recovered after irrigation of the abdominal cavity, eight without irrigation, while two died after irrigation; in one case, which ended fatally, obstruction was present. He had ten additional cases after this report with exactly 50 per cent. of deaths; three of the cases presented obstruction and ended fatally. He stated that in none of the cases which recovered was there extreme tympanitis, extension of the abdomen or complete obstruction, excepting the cases treated by the method advocated, namely, enterostomy.

Intestinal paresis has long been recognized as a very dangerous symptom, and many methods have been employed by surgeons to overcome it. Frequent attempts have been made to relieve the distention by aspiration with fine needles, but with little success. Van Arsdale stated that a thorough emptying of the intestines by larger incisions has never been recommended as a systematic method of treatment, but may have been used in certain single cases.

Van Arsdale's first case was one of appendicitis in which intestinal paresis developed two days following operation. Colotomy was performed, the presenting piece of intestine being opened with scissors after iodoform gauze had been packed around. The catheter was passed into the intestine, and irrigation with salt solution was employed. This was soon followed by free discharge of gas and fecal matter, which continued with great relief to the patient. Three days later the patient was much improved, distention disappeared and rapid recovery followed. The same method was employed in two other cases.

Van Arsdale very frankly acknowledged that conclusions as to the value of the treatment can hardly be drawn from so small a number of cases. He believed that "in the face of the graver forms of peritonitis, complicated as they are with paralysis, more or less marked, we are in so helpless a condition with our present surgical means to combat them that

¹ Annals of Surgery, January, 1899.

any method of treatment which appears to favor a good result must commend itself to our special notice."

He stated that openings in the large or small intestines for this purpose should be made longitudinally as in intestinal fistulæ rather than artificial ani, in which the gut is usually cut across. This longitudinal opening greatly facilitates their spontaneous closure.

SURGERY OF THE STOMACH.

Complete Removal of the Stomach. At the present time four successful cases of complete gastrectomy have been recorded, the first being the well-known case of Schlatter, of Zurich; the second that of Dr. Brigham, of San Francisco; the third, of Dr. Maurice H. Richardson, of Boston, and the fourth, of Dr. McDonald, of San Francisco.

Dr. Richardson states that prior to Schlatter's operation he frequently thought of the feasibility of œsophago-duodenostomy, although he had never attempted it upon the living subject on account of ignorance as to the immediate and remote effects of complete removal of the stomach, and it is for the solution of this problem, rather than for having overcome anatomical and surgical difficulties, that Schlatter should receive the highest praise.

Some points in the technique of the operation in Richardson's case are of interest: The first step was the separation of the omentum and exposure of the posterior gastric wall. Five inches of the transverse mesocolon were unintentionally included in the section, though no harm resulted. The tumor was removed an inch or more beyond the upper limits of the disease. Escape of the gastric contents was prevented by tying the pylorus with a narrow piece of gauze; the duodenum was divided transversely and the bleeding points caught with forceps. Bringing the duodenum to the œsophagus proved more difficult than was anticipated, because the duodenum was held back by its bloodvessels and other attachments. The restraining bands were cut, and about one inch was gained by this procedure. There was very little loss of blood, and the shock following the operation was slight; the entire duration of the operation was but one hour. On the second day the patient was given a little cold water by the mouth; on the third day milk and lime-water in small quantities were given every hour. Ten days after the operation nourishment was given in two-ounce quantities. Recovery was very satisfactory, and on July 5th, less than five weeks after the operation, the patient returned to her home and was able to ride five miles without fatigue.

We believe, with Richardson, that the indications for gastrectomy are limited. Removal of the stomach should be attempted only in those cases in which a wide margin of healthy tissue can be removed together

with the diseased. Very few cases will be found in which the stomach walls have become so extensively involved as to require complete extirpation without secondary deposits having taken place either in the adjacent glands or in the liver. If such deposits have occurred, extirpation, of course, is uncalled for.

As regards final results in these cases of complete extirpation, they are, of course, too recent to enable us to make any definite statement. Schlatter's case has just died, fourteen months after operation, of generalization of the disease and not from any cause connected with the loss of the stomach. Fortunately an autopsy was obtained. No marked dilatation had occurred at the site of the junction of the stomach and duodenum. I have just been informed of the death of Richardson's case, the patient having lived about ten months after operation.

The chief dangers to the patient lie in the direction of a return of the disease rather than in a failure of the intestines to carry on the functions of the stomach. When considering the question of the advantages and disadvantages of the operation, Richardson states that the operation, in suitable cases, is by no means useless, and he believes that the arguments for and against operation in cancer of the breast apply completely to cases of cancer of the stomach or intestine; he asks the question: "Is it justifiable to deny the patient with cancer of the stomach a chance for recovery, small though it may be?" He further adds that "operations, no matter how severe and dangerous, undertaken with the distinct possibility of benefit or of complete cure, cannot but elevate the art of surgery, even if they are but rarely successful."

I believe that there is decided danger of carrying this idea too far. In urging or performing operations in which the possibility of benefit or complete cure is extremely remote, we forget that while we may elevate the art of surgery from the point of view of the surgeon, we may do a great deal of harm in increasing the innate fear of surgery among the laity. We must remember that every unsuccessful case following operation for malignant disease has its influence in keeping others who might receive great benefit from going to the surgeon until too late.

Malignant Disease of the Stomach. Ewald, of Berlin, in a recent paper¹ gives his opinion as regards the success of surgery of the stomach in connection with malignant disease. He states that at present, as much as ever before, the demonstration of a tumor of the stomach, its position, size and mobility are the indications for operation. The fact that we operate earlier now than before is, he thinks, not due to our more refined methods of diagnosis, but to the increased confidence in our surgical technique. He states that at his hospital during two and a half years between 1894 and 1897 there were 25 gastro-enterostomies, with 16

¹ Philadelphia Medical Journal, August 18, 1898.

deaths, or 64 per cent. ; 12 resections, with 9 deaths, or 75 per cent. ; 22 gastrostomies, with 12 deaths, or 54 per cent. In the last year there have been 20 additional cases, 11 gastro-enterostomies, with a mortality of 64.7 per cent. ; 5 resections, with 62 per cent., and 4 gastrostomies, with 50 per cent. mortality. In 6 cases exploratory laparotomy alone was performed. On the whole, the results were better in women than in men, and the carcinomas that had developed from ulcers were found more favorable for operation than others, the explanation offered being that among women there is very seldom an abuse of spirituous liquors, and also that carcinoma developed on the basis of an ulcer is not so likely to cause carcinomatous cachexia as idiopathic carcinoma. He believes that there is a possibility of radical cure in about 25 to 30 per cent. ; of success from palliative measures in about 50 per cent. of the cases which, after careful investigation, physicians consider suitable for operation.

Unlike W. W. Keen, he believes that surgical technique has at present practically reached its limit, its marvellous success in the treatment of non-malignant neoplasms being the best proof of this. That the results are not better he attributes chiefly to the impossibility of diagnosing carcinoma sufficiently early.

I believe with Dr. Keen that the greatest advance in the surgery of malignant disease of the stomach, in the future, must depend upon increasing the number of exploratory operations, in doubtful cases opening and examining the stomach, if need be.

That the results of the operation of resection for cancer of the stomach have been so unsatisfactory, Mikulicz states, is partly due to the fact that, as a rule, patients do not seek medical or surgical assistance until the disease has reached an advanced stage, but also, and mainly, to the fact that our intervention is not sufficiently radical.

The resection of a cancer of the stomach in order to be radical should extend up to the duodenum, of which 5 to 10 mm. beyond the disease should be removed ; on the side of the cardia the resection should comprise 5 to 10 cm. of healthy tissue.

Papillomatous cancer with a large base he considers the least malignant, and the prognosis is comparatively favorable. Quite a different degree of malignancy is exhibited by cancers which infiltrate the muscular and submucous layers. If a cancer of this kind has its origin in the neighborhood of the pylorus it very soon causes stricture of the orifice, and an extensive operation may yet be tried. If, however, the pylorus is secondarily involved it is generally too late for operation. Between these two extremely malignant forms, we find all those intermediate varieties which are most frequently encountered.

Speaking of extirpation of the glands, Mikulicz says that the removal of the pancreatic gland is attended with the most serious difficulty, in

that one is apt, in excising the pancreas, to injure the vessels traversing it, notably the splenic artery; once Mikulicz even ligated the ductus choledochus.

As the operation in order to be radical will take some time, he recommends Schleich's anæsthesia, which even debilitated subjects can stand.

One of the complications that is frequently met with as a result of gastric operations, is pneumonia. In view of the autopsies Mikulicz has performed, he thinks it possible that they are due to embolism.

As regards the technique of the operation of resection of the stomach, the author believes that in the majority of cases anastomosis between the duodenum and the stump of the stomach is impossible. He generally closes the duodenum by a purse-string suture and establishes anastomosis between the inferior angle of the gastric wound and the jejunum. This gastro-jejunostomy is much simpler, takes less time, and, besides, is more rational in that it least changes the position of the stomach. Mikulicz has several times employed the Murphy button, but thinks that, though it saves time, it is not as reliable as sutures.

Indications for Gastro-enterostomy. The indications for gastro-enterostomy, summed up by Keen in the Cartwright Lectures, 1898, are as follows:

1. Malignant stricture of the pylorus.
2. Non-malignant stricture of the pylorus.
3. Ulcer of the stomach.

To these he would add a possible fourth indication, namely, obstinate digestive troubles which have not yielded to purely medical treatment. Routier, of Paris, has actually operated for such a condition.

The mortality of the operation in non-malignant disease is not very great, and has shown a gradual improvement since the introduction of the operation.

Chlumskij¹ has given the most complete statistics bearing upon the operation, having collected 550 cases. From 1881 to 1885, 35 cases were operated upon, with a mortality of 65.7 per cent.; from 1886 to 1890, 114 cases were operated upon, with a mortality of 46.47 per cent.; between 1891 and 1896, 401 cases were operated upon, with a mortality of 33.91 per cent.

Mikulicz's personal results in 74 cases prior to June, 1893, show a mortality of only 32.5 per cent.

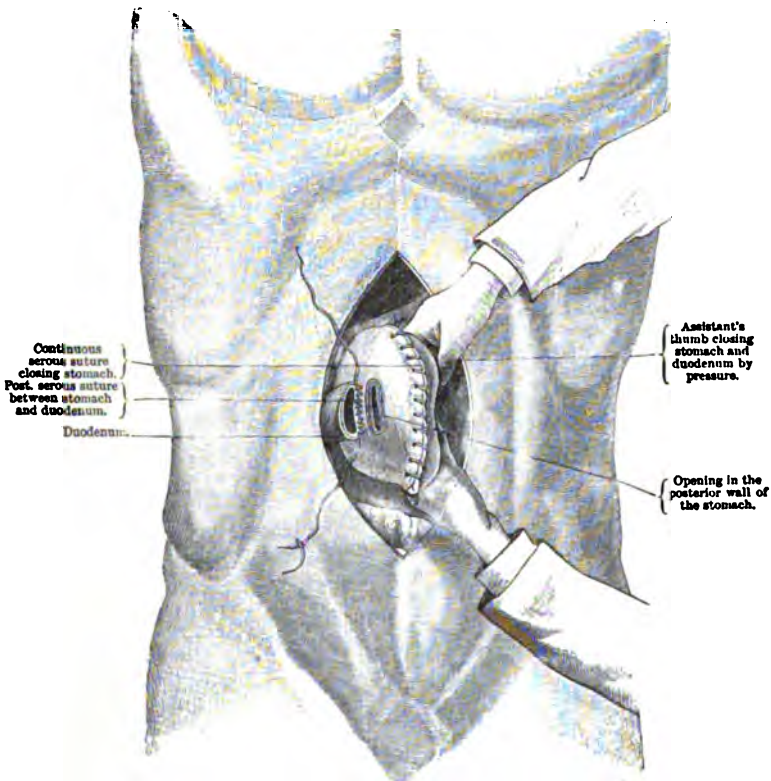
The statistics for non-malignant disease show a very low mortality. Carle's² 27 cases operated upon for non-malignant stricture present a mortality of only 7.4 per cent., and one of the deaths was due to an ulcer of the stomach rather than to the operation itself.

¹ Zeitschr. f. klin. Chir., 1898, Band xx. p. 231.

² Arch. f. klin. Chir., 1898, Band lvi., Heft 1.

The earlier methods of gastro-enterostomy—the Wölfler and Wölfler-Lücke methods—have recently been abandoned for the posterior gastro-enterostomy or Von Hacker's method. The mortality of the last two methods does not differ greatly. In 31 cases operated upon by the Wölfler method, the mortality was 38.9 per cent.; in 152 cases operated upon by Von Hacker's method, the mortality was 35.52 per cent. In 26 cases operated upon by Doyen's method, the mortality was only 11.54 per cent.

FIG. 1.



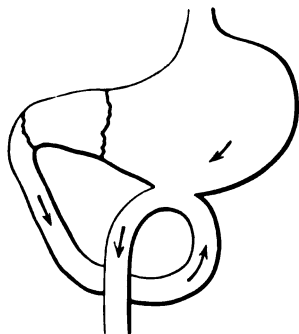
Kocher's method of resection of pylorus.

In nearly all methods of gastro-enterostomy it is possible to use either the Murphy button or simple suture. Each method has its advocates, though at present the weight of opinion seems to incline more strongly in the direction of the employment of the button.

Most of the variations in technique introduced within the last year or two have been in the direction of attempts to prevent reflux of the stomach-contents into the proximal loop of the bowel. The principal methods devised for this purpose are those known as Kocher's, Laucenstein's, Jaboulay's, Braun's, Doyen's, and Roux's. Of these methods

Keen says none accomplishes both safely and effectively the object in view; they prolong the operation greatly, debilitate the patient, increase the danger of infection and of the giving-way of the sutures. The ideal method, he believes, has not yet been found. I believe that in the method of Roux we have come measurably near the ideal.

FIG. 2.



Wölfler-Lücke method.

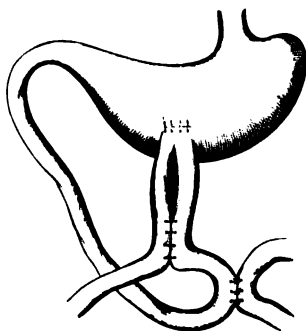
FIG. 3.



Jaboulay's method.

As regards the operation of gastro-enterostomy itself, several attempts have recently been made with a view of avoiding infection of the peritoneum by not opening the lumen of the stomach and bowel at the time of the operation. Postnikow incises only the serous and muscular coats, drawing out the mucous membrane of each and tying them with a liga-

FIG. 4.



Braun's method.

Fig. 5.



Postnikow's method of gastro-enterostomy.

ture, relying upon the resulting slough to complete the anastomosis. Bastinelli,¹ quoted by Keen, exposes the mucous membrane in the same way and cauterizes it with a Paquelin cautery.

Hartman and Soupault² state that the good results of gastro-enteros-

¹ Riforma Medica, August, 1893.

² Revue de Chirurgie, February, 1899.

tomy are the disappearance or considerable improvement of the subjective disturbances. In rare cases the general condition is not improved, but the pain, irritation and vomiting usually disappear even in these cases.

The observations of Hartman and Soupault upon the question of the danger of retention or backward flow of bile into the stomach are most interesting. They have never observed in their own practice this grave phenomenon described by the German surgeons under the name of "*circulus viciosus*." Although Hartman and Soupault have employed the more simple method of gastro-enterostomy, having never practised the methods of entero-anastomosis, or of making a valve at the orifice, or of gastro-enterostomy "*en Y*" of Roux, they state that the different methods of gastro-enterostomy appear to give similar results, and that in their own experience the results of the anterior gastro-enterostomy are the same as those of the posterior.

Villar and Thiriar state that anterior gastro-enterostomy favors the reflux of bile.

Hartman and Soupault state that the two cases in which this phenomenon was the most pronounced had both been operated on by the posterior method.

As regards the value of the method of Roux, designed especially to prevent the reflux of bile, they state no evidence is as yet available, but Roux's recent report before the French Congress of Surgery supplies the needed evidence.

Hartman and Soupault take issue with those who believe that reflux of the bile is a grave matter, and attempt to determine its chemical importance. They state that most physicians since Galen have regarded the reflux of bile into the stomach as a very grave matter, interfering with digestion and causing vomiting. Modern authors—Riegel, Malbrone Weil—have reported cases in support of this view, and Billroth and a great number of surgeons since have noted the gravity of bilious vomiting following gastro-enterostomy and have attributed it to reflux of bile, hence the numerous attempts and divers methods of operation to prevent such reflux.

Hartman and Soupault proceed to show that these opinions are erroneous. The action of bile upon the normal functions of the stomach has been interpreted in various ways. Weil believes that it acts as an irritant and excites vomiting. Others, among them Bernard, Riegel, and Moly, conclude from their experiments that bile hinders the digestion of fibrin and prevents the formation of peptones.

Hartman and Soupault state that these experiments were performed in test tubes, and that what is true in artificial digestion with fixed quantities is not true of natural digestion with varying quantities.

Dastre¹ experimented on dogs through gastric fistulæ, introducing bile in varying quantities during all stages of digestion. He examined the stomach contents at different periods and ascertained that the alkalizing effect of the bile was very quickly compensated by an increased flow of gastric juice, thus restoring the power of peptonizing. Dastre determined that bile (ox) introduced into the stomach of dogs at the moment of feeding exercises no appreciable effect upon the digestion, nor upon the general health of the animal.

Ruggeri Odi² carried out a series of similar experiments on dogs with similar conclusions. In addition he established in some cases communication between the stomach and gall-bladder; the common duct was obliterated and all the bile made to enter the stomach. Gastric digestion was in no way interfered with, and the animal showed an increase in appetite and in weight. Very recently Masse³ has practised this operation on a large number of dogs, some of which had been operated upon more than a year prior to the report, and his results fully confirm those of Odi and Dastre.

We have, furthermore, some evidence bearing upon the probable effect of the operation in man. Terrier, on December 19, 1895, made an anastomosis between the gall-bladder and the stomach in a case of chronic jaundice, associated with an epithelioma of the head of the pancreas. No vomiting followed. The patient left the hospital January 22, 1896, having shown much improvement. The appetite was good, and there were no digestive troubles. On February 10th the patient was again examined by Terrier, who found the gastric digestion sound and that there was no gas, flatulence, nor regurgitation.

Hartman and Soupault conclude with Masse that the reflux of bile has nothing to do with the vomiting and other symptoms following gastro-enterostomy. These phenomena are due, they believe, to the reflux into the duodenal portions of the bowel of partially digested food.

It seems to us that while the above experiments prove that fresh bile may freely enter the normal stomach without harm, it by no means follows that bile that has accumulated and become stagnant in the proximal loop of bowel is likewise innocuous in the more or less diseased stomach.

Resection of the Stomach. Schuchard, of Stettin, states that in sixty resections of the stomach performed during recent years there were found only five which presented favorable conditions. In one case, that of a patient fifty-eight years of age, he performed almost complete resection, leaving only a small portion of the stomach adjacent to the cardiac end, not more than two to three finger-breadths. This patient died two

¹ Arch. de Physiol., 1890, ii., 316.

² Azione della Bile sulla digestione gastrica Perugia, 1887.

³ Cong. Français de Chir., 1898.

and a half years afterward of metastases in the lung and pleura. At the autopsy a perfectly sound stomach was found. It presented itself in the form of a pouch with a capacity of 500 grammes, and had been formed at the expense of the cardia and duodenum. The patient, who immediately after the operation could only eat very small portions of food at a time, was finally able to take as much food as an individual in good health.

Results of Operations of the Stomach at Czerny's Clinic. Steudel,¹ of Heidelberg, reports 192 operations not including gastrostomies performed at Czerny's clinic up to the end of 1897, in which the average mortality was 29 per cent. The number of these operations has increased considerably. While in the first nine years, from 1881 to 1889, only 42 cases were operated upon, with a mortality of 45 per cent., in 1897 alone, 37 operations were performed with 6 deaths, or 16 per cent., showing a remarkable decrease in the mortality of the operation.

In subjects too much enfeebled to stand resection of the pylorus Czerny has recently tried to divide the operation into two stages, first performing gastro-enterostomy and later pylorectomy. The greatest difficulty experienced was the almost universal refusal of patients, as they were generally so much benefited by the first operation, to submit to the second, or at least until it was too late. Several of his cases of pylorectomy show very good final results, one surviving fifteen years. In this case resection was done for non-malignant disease of the pylorus. One patient operated upon for cancer was still alive and in good health seven years after the operation; another three and a half years; still another was alive and well nearly eight years after a cuneiform resection of the stomach for sarcoma.

Since 1896 Czerny has no longer performed pyloroplasty, on account of the very bad results. The results from the use of the Murphy button have been so good that since June, 1896, the suture is no longer employed. In 53 gastro-enterostomies done with the Murphy button there was a mortality of 24.5 per cent.; while in gastro-enterostomies performed with sutures the mortality was 36.8 per cent. In the 25 gastro-enterostomies performed within the last year the mortality has fallen to 14 per cent. Steudel states that in some few cases in which the clinical diagnosis of carcinoma was apparently confirmed upon operation, gastro-enterostomy has given a very appreciable prolongation of life. Four of Czerny's patients on whom this operation was performed two and a half, four, five, and five and a half years ago, respectively, are still well. The average duration of life after gastro-enterostomy in cases of carcinoma is eight, or, including the above cases, thirteen months.

¹ Beiträge zur klin. Chir., Band xxiii., Heft 182.

The following table from Steudel's elaborate paper is a valuable contribution to our knowledge of the surgery of the stomach :

	Pyloro- tomies.	Gastro- enteros- tomies.	Pyloro- plasties.	Explora- tory lapar- otomies.	Other ope- rations on stomach.	Total.	Mortality.
1881-1889 . . .	13	14	0	11	4	49	45 per ct.
1890-1893 . . .	7	17	3	5	2	34	18 "
1894-1895 . . .	2	23	7	8	4	44	27 "
1896 . . .	4	28	1	2	0	35	34 "
1897 . . .	3	28	0	4	2	37	16 "
1881-1897 . . .	29	110	11	30	12	199	29 per ct.

This table shows the early mortality of the beginning, 41 per cent., had been reduced to 16 per cent. in the year 1897, and it also shows that for the last three years practically only gastro-enterostomies and exploratory laparotomies were included in the figures. Of 173 cases of malignant tumors of the stomach, 51 died, a mortality of 29.5 per cent.

Von Hacker, of Innsbruck, reported nine cases of resection of the stomach, two of which were for sarcoma. One patient died as a result of the operation, and one was still alive six years after the operation, without recurrence.

Kausch, of Breslau, defends pyloroplasty against the criticisms of Steudel. He states that during the last year and a half nineteen pyloroplasties have been performed at Mikulicz's clinic for non-malignant stricture, and the results in all were good as far as could be ascertained.

Hahn, of Berlin, has reported twenty-eight resections of the stomach, of which ten died during the first fifteen days after operation and six are still alive, one four years and one seven years after operation. He does not think it wise to perform resections upon patients more than sixty years of age. In patients whose general condition is bad it is better to first do gastro-enterostomy and later resection.

Gussenbauer, of Vienna, during the last three and a half years has reported nineteen resections of the pylorus with seven cures; one of these cases was operated upon for lympho-sarcoma.

MURPHY'S BUTTON AND FRANK'S BUTTON. Storp,¹ of Königsberg, discussed at some length the value of the Murphy button. He believes that for a lateral anastomosis between the colon and small intestine sutures are preferable to the button.

König, Jr., of Berlin, has tried upon dogs the resorbable button of Frank, of Chicago. In five circular entero-anastomoses he had but one failure, in which he employed a button of too large size. Lateral anastomosis has given him less satisfactory results because of the button

¹ Deutsche Gesellschaft für Chirurgie, 1897.

obliterating the lumen of the intestine. By using a flatter button he believes it would be possible to overcome this difficulty.

Wölfler, of Prague, states that in circular entero-anastomosis the button of Murphy has several times become lodged in the intestine. He believes this objection was less serious in gastro-enterostomy for the reason that the contents of the stomach are usually liquid. Hence, it would not make so much difference whether the button remains in the stomach or not.

Wölfler stated that he had employed the resorbable button of Frank in six resections of the intestine and in three gastro-enterostomies. In two instances union did not take place; the button was passed on the third and eighth day respectively without the intestine having become gangrenous. This fact shows that the constriction is insufficient and that the button was absorbed too soon.

Jordan, of Heidelberg, states that the button gives better results as one becomes more accustomed to the handling of it; however, he advises against its use for the colon and cæcum.

Storp, of Königsberg, states that he has increased the resistance of the buttons of Frank by hardening them in formalin.

New Method of Resection of the Pylorus and Intestine. Doyen,¹ of Paris, describes his method of resecting the pylorus as well as of performing gastro-enterostomy. In his *Surgical Treatment of Diseases of the Stomach and Intestines*, published in 1895, he gives a description of a model of curved forceps with very elastic, supple blades, by means of which gastro-enterostomy or anastomosis can be performed without any risk of the escape of the contents of the viscus. Intestinal anastomosis occupies from ten to twelve minutes, and may be performed with remarkable safety. In September, 1897, he suggested the following change of operative technique for removal of a cancer of the cæcum: Two strong pairs of forceps are placed, one above and one below the tumor; the intestine is ligatured *en masse* and cut between the forceps and the ligature, 10 mm. from the latter; the stump of the tumor is at once wrapped in a sterile compress and held in place with a pair of curved forceps. The small stump on the upper end is freed by scissors from the débris of superficial mucous membrane and cauterized with a thermo-cautery. All that is now needed to close the ileum is to invaginate the ligature *en masse*, and this Doyen accomplishes by means of a double purse-string suture. The descending colon is then treated in the same way, the new growth removed, and then a lateral anastomosis is made between the ileum and the descending colon. By this method none of the intestinal contents escape during the operation. Doyen states that he has with

¹ British Medical Journal, November 5, 1898.

similar success applied this method to resection of the pylorus, to gastro-enterostomy and also to the method of gastro-enterostomy "en Y" of Roux, and to the removal of the appendix.

Kappeler¹ reports a series of 39 cases of gastro-enterostomy performed by him between the years 1887 and 1898, 12 of which died within thirty

Fig. 6.



After KAPPELER.

FIG. 7.



After KAPPELER.

days after operation, giving a mortality of 30.76 per cent. In this connection it should be noted that Kappeler performs resection of the stomach in preference to gastro-enterostomy in all cases where this is at all possible, a fact which greatly influences the mortality-rate of his gastro-enterostomies, for it is plain that if resection of the stomach is practised in all cases in which the tumor may still be removed, regardless

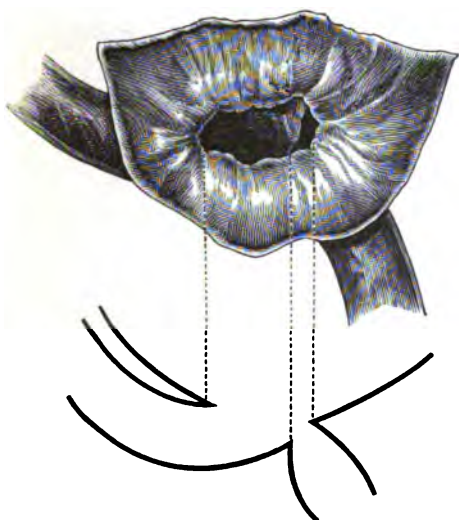
¹ Deutsche Zeitschr. f. Chir., September, 1898, Band lxi., Heft 2.

of the presence of metastases and the possibility of their complete removal, the prognosis of his gastro-enterostomies must be correspondingly worse. He bases his position on the conviction that the results of the former operation are better than those of the latter.

Of the 39 gastro-enterostomies reported, 31 were performed for carcinoma, 8 for perforating ulcer and related conditions.

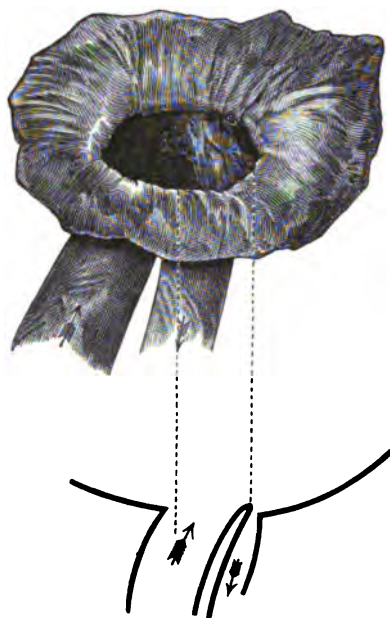
While, in view of the advanced stage which the disease generally has assumed before patients seek surgical aid, operations for the former disease as a rule afford but temporary relief, in the latter class of cases patients may be restored to perfect health by means of a gastro-enterostomy.

FIG. 8.



After KAPPELER.

FIG. 9.



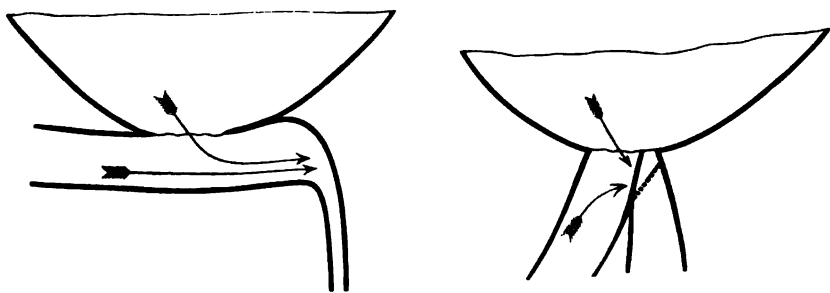
After KAPPELER.

Of the cases operated upon for perforating ulcer, etc., one died of collapse twenty-four hours after operation, another of hemorrhage from the stomach on the ninth day. The remaining six were cured, although two of them died four and five weeks later, of bronchiectasis and gangrene of the lungs. The other four patients were well at the time of the report. Of the 31 cases of carcinoma, 10 died within thirty days after operation. Of the 21 cures, 16 have since died, the average duration of life after operation being 5.1 months. Five patients were alive and well in July, 1898, three, six, six, and one month, and two and a quarter years respectively after operation.

As regards the methods of operation, in 8 cases of carcinoma Wölfler's method was employed, with 5 deaths; 10 cases (2 ulcer, 8 carcinoma) were operated upon according to Von Hacker's method, with 3 deaths; the remaining 21 cases (6 ulcer, 15 carcinoma) were operated upon by a special method (devised by Kappeler, Fig. 10), with but 4 deaths, or 19 per cent. (1 ulcer, 3 carcinoma).

As regards the causes of death Kappeler states that the most discouraging cases to the operator are those in which death occurs in consequence of an obstruction of the circulation of the intestine, due directly to the operation. As Kappeler's observations show, Wölfler's, Courvoisier's, and Von Hacker's methods afford no guarantee against this fatal occurrence. He states that at the autopsies he was struck by the fact that in these cases both shanks, efferent and afferent, of the attached loop of intestine—one well filled, the other empty—were found lying either closely together, parallel to each other, or forming a small acute angle, and taking an almost perpendicular direction downward toward the great curvature. While, on the other hand, in cases that had died from other causes, for example pneumonia, hemorrhage of the stomach, etc., and in which the fistula worked perfectly, the shanks of the attached loop were found to lie close to and parallel with the great curvature for 5 to 8 cm. before they took a downward course. (Fig. 10.)

Fig. 10.



After KAPPELER.

These observations, he states, led him to think that it was the horizontal suspension of both shanks of the loop sutured to the stomach which created such favorable conditions for the outflow from the fistula, and that the well-known viscus circle of the exclusive filling of the afferent shank and regurgitation of its contents into the stomach could thereby once for all be avoided. Extensive experiments upon the cadaver showed the following:

1. That in anterior gastro-enterostomy, as well as in posterior, upon filling the stomach both shanks of the attached loop would gen-

erally become filled, but, as a rule, the fluid would enter the left shank, so that the peristalsis of the intestines progressed parallel to that of the stomach into the afferent shank.

2. That a very large fistula facilitates the evacuation of the stomach contents into both shanks.

3. That in certain positions of the shanks of the attached loop it may happen that the afferent shank becomes filled, while the efferent shank remains empty on account of the formation of a spur, even though the stomach be filled to its utmost capacity, thus demonstrating the inefficiency of the methods at present employed to overcome this difficulty. (Fig. 9.)

After a series of further experiments as to the respective results of attaching the afferent shank alone, the efferent shank alone, and both shanks together to the wall of the stomach, he finally adopted a method of which the following is an outline. (Fig. 10.)

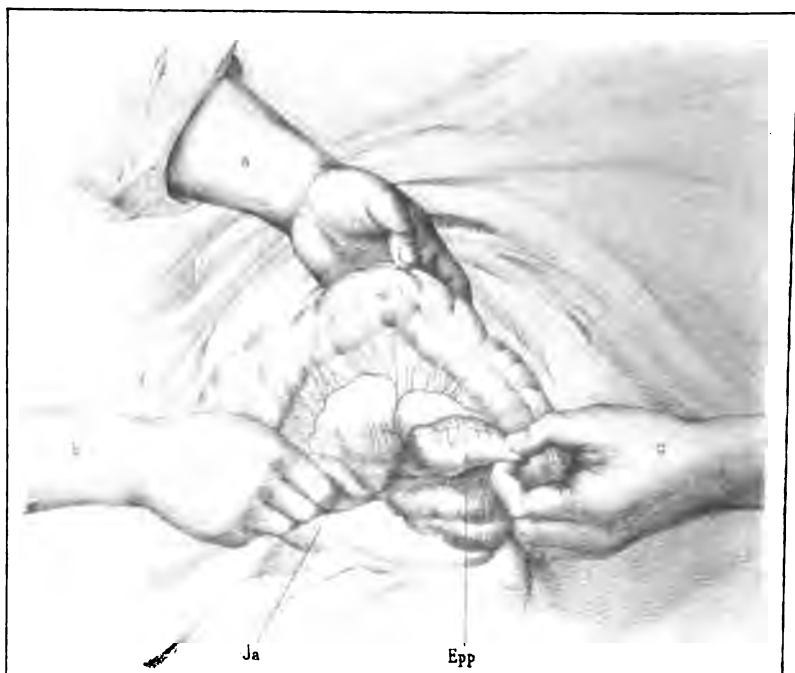
Stomach and intestines are thoroughly evacuated before operation. A vertical incision is made from the processus ensiformis to the umbilicus. If conditions are found suitable, Von Hacker's posterior gastro-enterostomy is performed in preference to the anterior, as in the former the position of the attached loop is more natural, and all conflict with the transverse colon is avoided. The transverse colon is turned upward and the uppermost loop of jejunum, 40 to 60 cm. below the plica duodeno-jejunalis, is smoothed out for 15 to 20 cm. and ligated carefully with two threads of stout silk. Then the posterior wall of the stomach, together with the transverse mesocolon, is pulled forward by the assistant and the latter incised vertically and bluntly pushed sideways so far as may be necessary to make room for the suspensory sutures. After due padding the ligated portion of the jejunum (its peristalsis in accord with that of the stomach) is sutured to the posterior wall of the stomach by a continuous sero-muscularis suture, 4 to 5 cm. long. Then the intestine and stomach are opened parallel to the suture line and, after careful mopping out of both, a continuous mucosa suture is put in. This is immediately joined to a continuous anterior mucosa suture, and the latter to an anterior sero-muscularis suture. Thereupon the ligatures of the intestine are removed. Then the efferent shank of the attached loop is smoothly and horizontally sutured to the stomach by a continuous suture 4 to 6 cm. long. Then the afferent shank is attached in the same way. After this, as a rule, gas escapes from the stomach into both shanks, and the firmness of the sutures is at once tested. After the loop and transverse colon are replaced the abdominal wound is closed. The suspension of both shanks takes but a few minutes.

Roux¹ refers to the very great progress in the surgical treatment of

¹ Congress of French Surgeons, 1898.

diseases of the stomach during the last two years. During this period, instead of not being able to perform any operation in 36 per cent. of the patients that came to him, there were but two patients in which he performed only exploratory laparotomy, and but two others in which no operation at all was indicated. He has performed eleven pylorectomies against fifteen gastro-enterostomies. Simple exploratory laparotomy was performed in the proportion of 4 to 100.

FIG. 11.



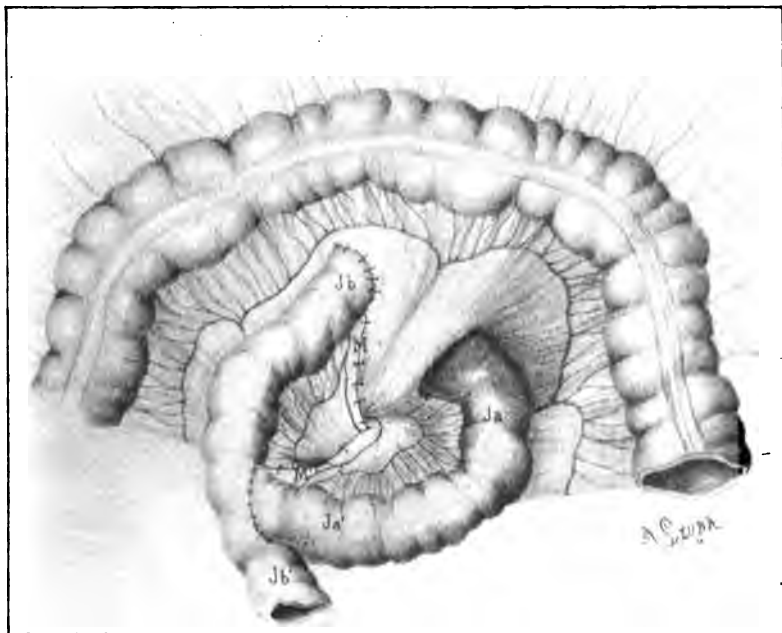
Roux's method of gastro-enterostomy "en Y."

As to the method employed, he has performed six ordinary pylorectomies, with one death; two according to Kocher's method, without mortality; four by the combined methods, with two deaths; in all twelve operations with three deaths. He has performed gastro-enterostomy by his own method—"en Y"—in thirty-one cases, with three deaths. He states that the most important fact to show is that posterior gastro-enterostomy "en Y," with three layers of suture, is not a dangerous operation in itself, in spite of its long duration and the possibility of the outflow of some of the gastro-intestinal contents. In a series of twenty-four gastro-enterostomies for non-malignant affections of the pylorus he has not had a single death.

Roux states that he can but recommend the trial of gastro-enterostomy "en Y." The results obtained in non-malignant disease show that the operation itself is not the cause of the failures, but the debilitated condition of the patients on whom one is often constrained to operate.

Monprofit¹ gives the results of 19 gastro-enterostomies for cancer and chronic gastritis; 14 were for cancer, with 2 deaths; 5 for chronic gas-

FIG. 12.



Roux's method of gastro enterostomy "en Y."

tritis, with no deaths, and in all five of these cases the gastric trouble entirely disappeared as a result of the operation. These cases are very important, inasmuch as only very recently has the operation of gastro-enterostomy been proposed or advised for this trouble. Nine operations were performed by Wölfler's method, with 5 perfect results, 2 satisfactory and 2 bad; 6 were operated on by Von Hacker's method, with 5 excellent results, 1 fairly good; 2 operations were performed by the method of Roux, "en Y," with 2 perfect results. Monprofit believes in using posterior anastomosis, either lateral or "en Y," whenever possible. He employs no mechanical aids, using silk sutures.

Method of Roux.² Gastro-enterostomy "en Y." Every patient

¹ Congrès Français de Chirurgie, 1898.

² Revue de Gynécologie et de Chirurgie Abdominale, 1897, No. 1, p. 89.

in feeble condition is given medicated injections for several days prior to operation. He has great faith in subcutaneous and intravenous saline solutions, and these are always ready for use day and night. Ether narcosis is used. As to the method of procedure, the abdomen having been opened the transverse colon is lifted up and the mesocolon opened widely, exposing the posterior wall of the stomach. The upper portion of the jejunum is then quickly recognized. The jejunum is then divided between two Kocher clamps and the incision prolonged through the mesentery to the first arterial bifurcation at about 20 to 30 or more cm. from its origin. The upper portion of the cut jejunum is wrapped in gauze and placed to the left side, the lower portion is grasped by an assistant, who draws the stomach toward the opening in the mesocolon, and by gentle traction of the forceps brings the end of the gut into contact with the stomach, while the operator introduces the first row of sero-serous continuous sutures, using an ordinary sewing needle, into what will be the posterior border of the opening in the stomach. An incision is then made through the serous and muscular coats, and a second sero-muscular continuous suture applied. Opening the mucosa of the stomach, abrasion of the intestine behind the Kocher clamp, a third continuous suture of the mucous layers entirely around, and a sero-muscular suture anterior followed by a sero-serous suture, complete the anastomosis. The stomach is then loosened and the mesocolon is fastened around the intestine, like a collarette, by a few catgut sutures.

The principal sutures are silk. The hemorrhage attending the operation is trifling, seldom requiring ligatures. The incision in the stomach is parallel to the greater curvature.

Roux sees no advantage in the perpendicular incision of Doyen or in the oval incision of Jaboulay. He endeavors to prevent stenosis by making a large opening in the stomach by implantation of the end of the gut instead of lateral anastomosis, and, above all, by securing healing by first intention of parts; these unite firmly and perfectly in a few days if one takes the trouble to suture in three layers without any appliance and modifications incompatible with immediate reunion.

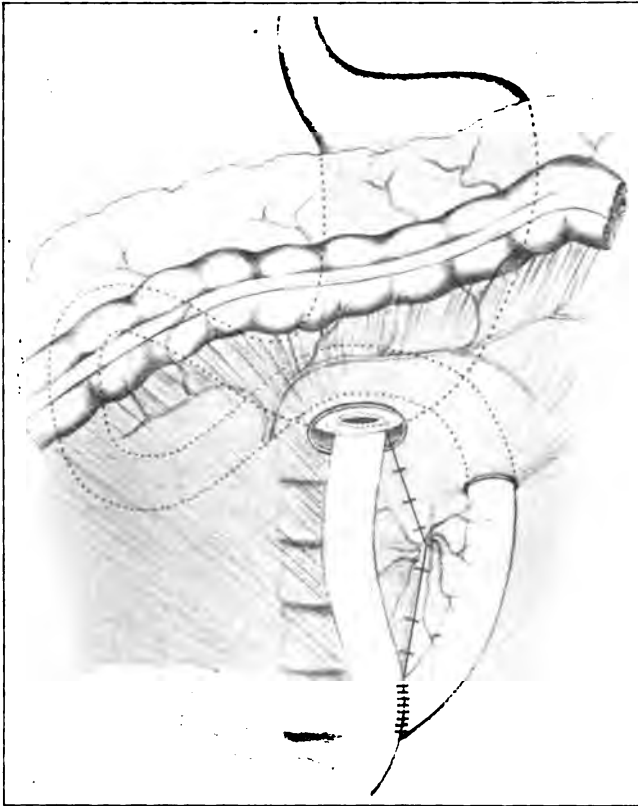
The implantation of the upper end of the jejunum is then made in the same manner, choosing, when possible, the face opposite the mesentery, and making the incision shorter.

Roux advises fixing the edges of the mesenteric incision in two or three places in order to prevent internal strangulation—a danger which advocates of other methods seem not to have considered. Roux attributes the fact that it has not been more often noted to the small number of autopsies performed on fatal cases.

Immediately after operation an injection of salt solution is given (800 to 2000 c.cm.), and later on nutritive enemata, champagne, bouillon,

often with a little strychnine. Above all, as soon as recovery from ether is complete—*e. g.*, two or three hours after operation—the patient is given something to drink, such as champagne, milk, tea, etc. If vomiting occurs the stomach is at once washed out, and the patient is allowed to drink on the following day. The patient has what he likes, and if he has no desire to eat, one should tempt him, if possible, to take food.

FIG. 13.



Roux's method of gastro-enterostomy "en Y."

Roux states that this method of after-treatment would undoubtedly cause death in a wound badly sutured or held by a button, yet he holds that far more patients die although the operation has been well performed, because, in spite of every care in the matter of artificial feeding, they continually become weaker. These cases he believes can be saved if one is able to make them ingest something by the stomach, thereby establishing the functional activity of the upper portion of the digestive tract. Even a slight evacuation, it may be no more than gas, contributes as much to the cure as all our efforts.

Although Keen,¹ in the Cartwright Lectures for 1898, stated that the ideal method of gastro-enterostomy had yet to be discovered, I believe that the method of Roux comes very near the ideal. It is certainly ideal in the skilled hands of its inventor, though I do not believe it would give as good results as the button in the hands of surgeons but little accustomed to intestinal work; yet this should not weigh against it, for cases requiring such operation are rarely emergency cases, and can almost always take the time to secure the experienced surgeon.

Roux's mortality in 31 cases operated upon by his own method is only 9.6 per cent., and in 24 cases for non-malignant stenosis he has not had a single death. Comparing the mortality with that of Chlumskij's statistics, 38.09 per cent. in 231 cases operated on by Wölfler's method, and 35.52 per cent. in 152 cases operated on by Von Hacker's method, we see that while all the disadvantages of the older methods as regards the reflux of bile and food have been done away with, this great gain has been accomplished without additional risk, and, moreover, with a far lower mortality.

Roux performs his operation without any mechanical aids in forty-five to fifty minutes. This time could probably be shortened by the use of Laplace's forceps.

The Surgical Treatment of Gastric Ulcer. Professor J. Berg,² of Stockholm, gives a very valuable report of thirty cases of ulcer of the stomach personally observed. The cases are divided into three groups; the first, containing ten cases, is characterized by ulcers with an infiltration simulating a tumor which could be made out by palpation. The second group is characterized by cicatricial stenosis of the pylorus and dilatation of the stomach—seven cases. The third group is characterized by pyloric stenosis, associated with different diseases of the stomach—seven cases. The remaining six cases were of a miscellaneous nature.

The ten cases of the first group were treated by pylorotomy; three by segmental resection of the anterior wall of the stomach; two cases by Mikulicz's pyloroplasty operation; the remaining cases by gastro-enterostomy. (Berg believes that pyloroplasty is inferior to gastro-enterostomy.) All cases were cured.

In the second group one case was treated by pyloroplasty and six by gastro-enterostomy, and all were cured. In the single case treated by pyloroplasty it was necessary, one and a half years later, to perform gastro-enterostomy. He employed pylorotomy for those cases alone in which there was suspicion of cancer.

The seven cases of the third group were all successfully operated on by gastro-enterostomy, pyloroplasty, and gastroplasty.

¹ Philadelphia Medical Journal.

² Nord. Med. Archiv, 1899, No. 22, St. Paul Medical Journal, March, 1899.

The six miscellaneous cases were not all associated with ulcer. In one case there was a duodenal ulcer; in one there was a solid adhesion in the shape of a cord between the fundus of the stomach and the abdominal wall.

Berg's conclusions are summarized as follows:

1. The majority of the patients which the surgeon actually receives for treatment of gastric ulcer or other benign diseases of the stomach are too far advanced to be benefited by surgical treatment.

2. Relapses of the symptoms of ulcer, signs of perigastritis, especially in the region of the pylorus, repeated symptoms of retention, are the chief indications for abandoning medical and adopting surgical treatment.

3. More intimate co-operation between the surgeon and the physician would be likely to make better results possible.

At the recent Italian Congress of Surgery, Tricomi¹ presented an important paper upon the radical treatment of simple ulcer of the stomach in course of evolution. He collected 29 cases with 4 deaths, in which the operation of gastro-enterostomy was performed by other surgeons for gastric ulcer during its evolution. To these he adds 21 cases operated on by himself, with 1 death, or a total of 50 operations, with 5 deaths, a mortality of 10 per cent. He states that with exclusive medical treatment ulcer of the stomach gives a mortality of 31.8 per cent., hence surgical intervention in these cases would save 21.8 per cent. of the patients. The radical treatment of ulcer of the stomach in evolution, therefore, gives 90 per cent. of cures. In order to obtain the best results one should decide to operate before symptoms of cachexia have developed. Tricomi sums up the indications for surgical intervention as follows:

1. Recurrent ulceration with progressive emaciation.

2. In ulceration not improved by internal treatment scrupulously carried out for some time, operation should be performed as soon as the general condition becomes affected.

3. Obstinate vomiting with or without severe pain.

4. Hemorrhage, not profuse, but frequently repeated.

5. Emaciation and cachexia before they have reached a marked degree.

6. Gastric dilatation.

7. Formation of tumor in the region of the stomach.

8. Perigastric adhesions in the anterior abdominal wall.

9. The social condition of the patients—*i. e.*, with regard to the amount of work they are obliged to do—must be considered.

Tricomi regards gastro-enterostomy as the method of choice.

Of the twenty-one patients he operated upon, one died of acute peri-

¹ *Revue de Chirurgie*, February, 1899.

tonitis. In twelve cases he practised the operation "en Y" of Roux, and all were cured. He prefers this method, which always gives most excellent results. The great advantage of Roux's method, as we know, is the prevention of any reflux of bile into the stomach, the contents of the stomach working back into the afferent loop. The mortality of the operation of Roux varies, of course, according to the nature of the trouble for which the operation is performed. Tricomi estimates it at 14 per cent.

SURGERY OF THE DUODENUM.

Perforating Ulcer of the Duodenum. Duodenal perforation is closely associated with gastric perforation, both anatomically and clinically. Collin,¹ who collected 262 cases, found that the ulcer was situated within two inches of the pylorus 242 times, while it occurred in the descending portion 14 times; in front of the aorta, 3 times, and 3 times in the ascending portion. In 85 per cent. of the cases there was a single ulcer; in 11 per cent. two ulcers; while in 4 per cent. three or more were present. The anterior wall is almost always affected. The percentage of perforation in duodenal ulcer is even higher than it is in gastric ulcer, and is variously estimated at from 40 to 70 per cent. In a few cases a duodenal ulcer has perforated retro-peritoneally.

In all acute abdominal troubles the happy issue rests less upon the facility of the operator than upon the promptness with which the physician makes a correct diagnosis. This statement is nowhere more evident than in the presence of a duodenal perforation. The diagnosis of ulcer of the duodenum has rarely been made during life, and even after perforation has occurred the true condition has not been recognized, though much has been written during the past year to establish the diagnosis of perforation on a sure foundation.

It had already been recognized that perforation occurred in many instances without previous illness; 27 out of 52, according to Perry and Shaw.² Recent writers have confirmed this point, although some patients who may be said to have been in good health at the time of perforation had suffered more or less from indigestion in previous years.

Perforation sometimes comes three or four hours after meals, and sometimes during a meal. Several times it has been preceded by a drinking bout. Sometimes a strain or a quick motion³ is the immediate forerunner of the rupture in the intestinal wall. This is not necessary,

¹ Schwartz. Bull. et mem. de la Soc. de Chir., 1898, p. 3.

² Perry and Shaw. Guy's Hospital Reports, 1894.

³ Taylor. North Carolina Medical Journal, February, 1899.

however, as the rupture may take place while the patient is perfectly quiet.

The perforation is marked almost invariably by sudden, severe, perhaps agonizing pain, situated most frequently in the epigastrium or right hypochondrium. Unlike the pain from perforated gastric ulcer, it does not radiate into the back.¹ Schwartz says that the pain begins in the right hypochondrium or epigastrium in one-half of the cases. Wanach² warns against placing too much dependence on this sign; he thinks that the pain is usually referred to the umbilicus, as does Burwinkel. Weir and Foote³ found that pain began in the epigastrium or right hypochondrium in four-fifths of their collected cases, and in cases collected by them later the pain was described as epigastric by one-half of the patients, and as right hypochondriacal by one-fifth. Later the pain becomes general, or may centre in the lower portion of the right side of the abdomen.

Obliteration of the liver dulness has been looked upon as a diagnostic sign of great value in perforation of the stomach or intestine. A wider experience is tending to alter this opinion. The liver dulness usually disappears when perforation has taken place, but it does not necessarily do so, and what is of more importance, the distention of the colon may entirely obliterate the liver dulness without any perforation being present. This has been proved by operation, as in a very striking case reported by Toogood,⁴ in which after an attack of pain and vomiting, followed by collapse and loss of liver dulness in a man with a history of gastric ulcer, the abdomen was opened, as the diagnosis of perforated gastric ulcer was considered absolute. Nothing was found, and the wound was closed. The patient died in a short time, and the autopsy revealed a small rent in an aneurism of the arch of the aorta. Distention of the colon had obliterated the liver dulness. Such facts place a question mark after the cases of "undoubted perforation" which have recovered spontaneously, such as those reported by Phillips and by Fowler.⁵

There is usually little rise in the temperature until peritonitis develops. The pulse is often accelerated out of proportion to the temperature, but it may be slow, 60 or even only 30 per minute.⁶

Collapse is almost always present, the countenance expressing the presence of a grave abdominal lesion.

For the first few hours, or for a day or so, there is generally no vomiting, though exceptions have been noted, and even bloody vomiting may occur. There is usually constipation.

¹ Burwinkel. *Deutsche med. Wochenschrift*, 1898, p. 823.

² Wanach. *Archiv f. klin. Chir.*, 1898, vol. lvi., p. 425.

³ Weir and Foote. *Medical News*, 1896, vol. lxxi.

⁴ *Lancet*, 1898, vol. i. p. 1476.

⁵ *Loc. cit.*

⁶ *Loc. cit.*

The diagnosis of perforation of a duodenal ulcer has rarely been made before operation. Under the supposition that the lesion was appendical, the incision has usually been made in the right iliac region. Some patients, weakened by this false attempt to reach the seat of trouble, were put back to bed. They have all died. Others still showed enough vitality to encourage the surgeon to continue his search until the perforation was found and closed. Unfortunately, most of these cases have also died, but as they had general peritonitis at the time of operation, they may truly be said to have died from this condition and not from the operation.

So far as is known, only five patients have recovered from perforation of the duodenum, with suture. These five were operated upon thirty (?), twelve, fifteen, and ten hours respectively after the occurrence of perforation, by Dean,¹ Dunn,² Landerer,³ Wanach, and Taylor. One of these patients died in two months of intestinal obstruction caused by a band of adhesions; another in six months of perforation in a new ulcer. The others were still well at last reports. In two of these five cases the incision was made for appendicitis.

As in perforated ulcer of the stomach, all writers insist on the necessity of early operation, if one would save his patient.

Opinion is divided as to the treatment of the peritoneal cavity after the suture of the ulcer. Bush⁴ wiped dry the peritoneum in two cases of gastric perforation; one recovered. Wallis sponged out an abdominal cavity which had been soiled with stomach-contents for ten and one-half hours. No peritonitis followed, and the patient recovered. He is of the opinion that irrigation leads to subphrenic abscess. On the other hand, Morse considers sponging more irritating than irrigation. He operated on four patients for perforated gastric ulcer, losing only one, and in that case twenty-four hours had elapsed between perforation and operation.

It is generally believed that the large majority of ulcers of the duodenum occur in men, although no one has offered a satisfactory theory to explain this. The recently reported cases treated by operation are quite in accord with the commonly accepted belief. Including the cases of last year with the previously recorded cases of perforated duodenal ulcer, no one of which antedates 1894, we have a total of twenty-six cases. Of this number only three occurred in women, and curiously enough these three women furnished two of the five recoveries from operation.

At a recent meeting of the New York Surgical Society (March 8,

¹ Dean. Medical Society Transactions, 1894, p. 305.

² Dunn. British Medical Journal, 1896, i.

³ Landerer and Glucksmann. Mitt. a d. Grenzgeb. d. Med. u. d. Chir., 1896.

⁴ Bush. Lancet, 1898, ii.

1899), J. F. Erdman reported two cases of operation for perforating duodenal ulcer. Both occurred in men aged thirty and forty years, and in both the perforation was situated in almost exactly the same place, about one inch beyond the pylorus. The perforation was about the size of a lead-pencil and with a closely cut edge, as if made by a punch. Operation was performed about four hours after supposed perforation in one case and eight hours in the other. Both died shortly after operation, four and fourteen hours. Erdman reported another unsuccessful case operated on one and a half years ago, twenty hours after operation, this occurring in a woman. Dr. McCosh also reported two recent fatal cases at the Presbyterian Hospital.

SURGERY OF THE COLON.

THE REMOVAL OF THE WHOLE TRANSVERSE COLON, WITH PARTIAL RESECTION OF THE PANCREAS AND GREATER CURVATURE OF THE STOMACH FOR CARCINOMA, WITH LATERAL SUTURE OF THE SUPERIOR AND INFERIOR MESENTERIC VEINS, is the somewhat formidable title which describes a unique operation in abdominal surgery performed during the past year. The operation was performed by Dr. A. Schweitzer,¹ of St. Paul, Minn., and is probably the first successful case of removal of the entire transverse colon. The operation was performed for carcinoma of the colon on October 17, 1898. The base of the growth of the mesocolon was 8 cm. broad and 3 to 4 cm. thick, extending from the right side of the duodenum over to the lower part of the head of the pancreas toward the left to about the middle of the pancreatic region. The superior and inferior mesenteric veins were injured during the operation, thus giving rise to profuse hemorrhage. With a very fine needle and silk a continuous lateral suture was made of the wall of the veins. It seemed unwise to use the Murphy button in the colon, because it was feared that a button of large size might cause trouble and, furthermore, because experience with the Murphy button in the large intestine has not, up to the present, been altogether favorable. Some difficulty was experienced in uniting the two ends of the bowel, for the reason that the lumina were unequal in the proportion of 2 to 3. This difficulty was overcome by keeping one lumen stretched and the other relaxed during the process of suturing, for which a continuous double silk suture was employed. No attempt was made to unite the mesocolon. The time of operation was exactly three hours. The patient did well for ten days, when some of the sutures in the abdominal mass gave way and the intestine could be seen at the bottom of the wound ;

¹ St. Paul Medical Journal, March, 1899.

it was carefully packed with iodoform gauze, and a little later was resutured.

At the time of the report, December 7, 1898, nearly two months after operation, the patient was in good health and had gained eleven pounds in weight. It was stated that there was complete absence of pain, easy and free defecation, normal pulse and temperature, increasing weight, and greatly improved mental condition. The surgeon stated that although a radical cure cannot be claimed, such improvement as was noticed justifies this operation, notwithstanding the high mortality necessarily attending such cases.

I believe that such an operation, while undoubtedly a brilliant triumph of abdominal surgery, should be classed with that of a complete gastrectomy. As I have already observed in connection with the latter, the indications for its employment will rarely be found.

SURGERY OF THE GALL-BLADDER AND BILE DUCTS.

Surgery of the Gall-bladder. Hans Kehr,¹ who has long been known as one of the highest authorities on the surgery of the gall-bladder, has recently reported his experience during the past eight years in the surgical treatment of cholelithiasis. Nearly half of the operations have been performed since 1896. The total number of patients was 307, 255 women and 52 men. The total mortality was 11.7 per cent.; ruling out, however, the cases in which death was due to the condition found at operation rather than to the operation itself, such as advanced carcinoma, purulent inflammation of the gall-bladder, etc., the actual death-rate is lowered to 3.8 per cent. Kehr practices the most rigid asepsis, occupying nearly half an hour in sterilizing his hands, and does not attempt to use rubber gloves. He operates with the smallest possible amount of assistance, employing but one assistant and one nurse. Another point which he considers of very great importance is the preparation of the patient. The bowels are thoroughly purged, and several baths are given prior to operation. In 180 cases calculi were situated either in the gall-bladder itself or in the cystic duct. In 128 cases operation was performed in one stage, and although inflammation and suppuration were present in two-thirds of the cases, only three deaths occurred. The calculi had reached the common duct in forty-six cases, and in these they were removed by choledochotomy. There were four deaths. In nineteen cases conditions other than suspected gallstone were found, as, for example, gastric ulcer, floating kidney, etc. In addition to the gallstones, in forty-six cases there were found complications such

¹ Volkmann's klin. Vortrage, October, 1898, No. 225.

as advanced carcinoma of the liver, common bile-duct, stomach and pancreas, purulent cholangitis, cirrhosis of the liver, and septic peritonitis, making treatment either impossible or extremely difficult. Of these cases twenty-six ended fatally. Kehr urges the importance of the greatest care and skill in diagnosis, and believes that we ought to recognize the following conditions: Gallstones in the gall-bladder without occlusion of the cystic duct, calculi in the gall-bladder with temporary occlusion of the cystic duct, cholecystitis, hydrops and emphysema of the gall-bladder, pericholecystitis, acute occlusion of the common duct, and chronic occlusion of the common duct. In suitable cases operation is advocated. Kehr believes that operation affords permanent relief and has not observed recurrence in a single instance. He emphasizes the advantage of early operation, and states that the sooner the condition is recognized and subjected to surgical treatment, the better.

CHOLECYSTOTOMY. The operation of cholecystotomy when there are no complications may at present be said to be almost, if not quite, as free from risk as the operation for appendicitis during the interval. In 115 cholecystotomies performed by Mayo Robson,¹ there were only five deaths. Three of these cases were complicated with cancer, and the remaining two with infective cholangitis and jaundice; hence, in 110 uncomplicated cases there was no death.

In regard to the various methods that have been proposed to prevent fistulæ following operations on the gall-bladder, the simple method described by Robson is probably the best. In his first ten cases operated on by stitching the gall-bladder to the skin, fistulæ followed in five, or 50 per cent. In his last 160 cases operated upon by suturing the edge of the gall-bladder to the aponeurosis, instead of to the skin, there were but seven fistulæ, and all of these were cured by further cleaning of the ducts or by short-circuiting the obstruction.

After the gall-bladder and bile-passages have been thoroughly cleaned, Robson inserts a non-perforated rubber drainage-tube into the gall-bladder. Then the edges of the incision of the gall-bladder are brought up and sutured by fine chromic catgut to the aponeurotic layer of the abdominal wall.

The so-called ideal operation suggested by Langenbuch,² in which the opening of the gall-bladder is sutured and the gall-bladder returned into the abdominal cavity, Robson does not favor, preferring to suture the gall-bladder to the abdominal wall. If the gall-bladder is to be closed, he emphasizes the great importance of being sure that the ducts are pervious. While recent cases may show that closure of the gall-bladder is comparatively free from risk, Robson believes the most serious objection

¹ *Diseases of the Gall-bladder and Bile-ducts*, 1898.

² *Centralblatt f. Chir.*, 1887.

to be that it does not give us the benefits of drainage which are obtained by the ordinary method.

A MODIFICATION OF CHOLECYSTOTOMY BY POPPERT, OF GIESSEN. The first steps of the procedure recommended by Poppert are the usual ones, namely, incision of the gall-bladder and removal of the calculi; then, however, instead of directly suturing the bladder to the abdominal wound, he establishes between the two a narrow drainage by means of a thick and long drain, which is fixed by a suture in the lowest point of the incision in the bladder, and the lips of the wound are drawn as tightly as possible around it. The other end of the drain is sutured to the abdominal wound and is surrounded by a wick of iodoform gauze, which at the same time serves as a dressing for the bladder incision. The bile flows out through this tube of caoutchouc. In ten to fifteen days the obliteration of the bladder around the drain ceases, as is shown by the fact that the bile impregnates the wick and soils the dressing. At this time, however, the adhesions having been formed around the drain, there is no longer any danger of the bile escaping into the peritoneum. Then the iodoform wick can be taken out, and at the end of from three to four weeks the drain is removed. The fistula closes rapidly.

The author has practised this mode of drainage in forty-seven cases of simple cystostomy, and in ten cases cystostomy combined with a cysticotomy or a choledochotomy. He has never had a failure and claims the following advantages for his method:

1. It is extremely simple, and may be practised in all cases where the bladder is distended or contracted. The method can be employed even in friable bladders—which heretofore have been considered as unfit for operation—and even in worse conditions.

2. It does not cause the formation of tight adhesions between the bladder and the abdominal wall and does not cause any painful contractions of the bladder and great biliary canals when the bladder and liver resume their places.

3. It affords protection against peritonitis, for as the bile flows out of the cystic wound it is absorbed by the tampons. The tamponade becomes particularly valuable when it is necessary to open an abscess situated above the bladder.

Surgery of the Bile-ducts. Dr. W. S. Halsted¹ describes a new method of suturing the common duct by means of miniature hammers. With these hammers Dr. Halsted has five times sutured the common bile-duct in dogs, and twice the common duct, and once the cystic duct in the human subject. The result in the latter is not stated. In using the hammer he states that it is not necessary to dissect the duct from its bed,

¹ Bulletin of the Johns Hopkins Hospital, April, 1898.

but the wall of the duct should be clearly exposed at the site selected for the incision. He usually incises the common bile-duct near its duodenal end. Before incising the duct two pre-section stitches are introduced which serve as retractors. The stone having been removed and the gall-passages explored, the hammer is introduced and the duct is gently raised from its bed toward the operator. Mattress sutures are then applied by means of very fine specially made needles. He states that the stitches necessarily perforate the wall, but adds that no harm results from the perforation, inasmuch as the normal duct is practically always sterile. The hammer is supposed to have the following advantages :

1. The duct suture can be drawn toward the incision and brought within easy reach of the operator.
2. The hammers by expanding the duct make it possible to introduce the stitches with great accuracy and without fear of including the opposite wall.
3. The operation is a very clean one, the hammer preventing the escape of bile.
4. With the hammer, wounds of thin, normal ducts can be easily and accurately sutured. Hence the surgeon may, if he chooses, fearlessly operate upon the common duct as soon as the obstruction takes place.

Although this contrivance of Dr. Halsted has much to recommend it theoretically, we must not forget that surgery of the common bile-duct is at present but little developed. There is by no means a unanimous opinion in support of the wisdom of suturing the common duct ; in fact, the most recent statistics upon the subject militate against all attempts at suturing. In a discussion before the Société de Chirurgie in Paris, Quenu¹ brings forward strong testimony against suturing the duct. He has collected ninety-five cases of choledochotomy, of which six were personal ones. In the first case in which he practised suture of the common duct, symptoms of biliary intoxication appeared on the fourth day and ended in death. In the second case choledochotomy was made in two stages without any attempt at suturing the duct. The patient recovered. In the third case the duct was sutured, and here also symptoms of biliary intoxication ending in death

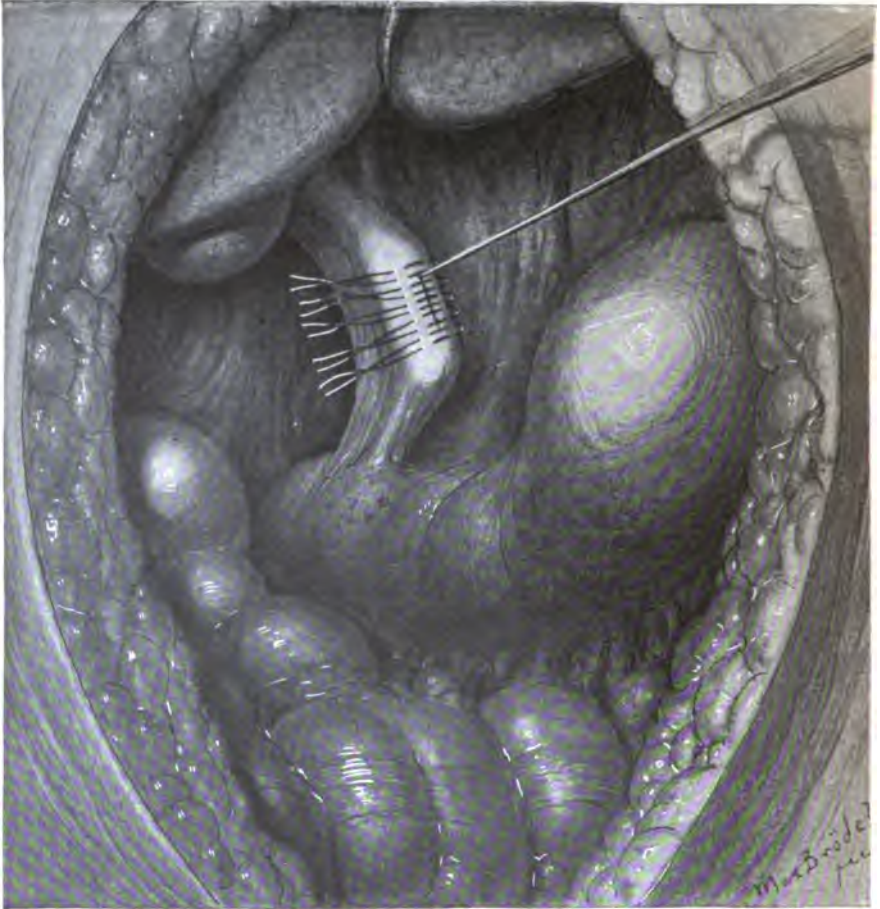
FIG. 14.

Halsted's hammer
for suture of com-
mon duct.

¹ Revue de Chirurgie, January, 1898.

occurred. In the fourth case, while the duct was sutured at the time of the operation, as symptoms of biliary intoxication occurred the sutures were cut; a good result followed, and the patient left the hospital at the end of six weeks without biliary fistula. In the fifth case the duct was sutured, but the sutures were afterward released and a drain was introduced, as symptoms of intoxication were setting in. This patient

FIG. 15.



Halsted's hammer for suture of common duct in place.

recovered. In the sixth case Quenu refrained from suturing the duct. The patient made a good recovery within one month.

A study of these observations convinced him of the disadvantage of making any attempt at suture. The statistics of the ninety-five cases that he was able to collect confirm this opinion, showing that the operations in which the duct was sutured, and in which the sutures held, were

followed by a mortality of 35.5 per cent., while the mortality in the cases in which no suture was applied was only 18 per cent.

Contrary to Langenbuch,¹ who advocates early extirpation of the gall-bladder not only for biliary calculi, but also for dropsy and empyema of the gall-bladder, and who holds that it should be the aim of the therapist not only to remove the result, but also the cause and seat of the disease by operation if possible, claiming that if we can get along without a diseased gall-bladder we must also be able to do without the healthy organ, it is Rose's² aim to limit extirpation and choledochotomy as much as possible—i. e., to cases where the cystic duct is permanently and incurably closed. Instead of extirpation and choledochotomy, he proposes cleansing out the bile-ducts by opening the gall-bladder at its base, and from that point proceeding to extract the gallstones until it can be ascertained by means of a sound and digital exploration that they are cleared from calculi. Rose considers the retention of the gall-bladder important, believing that the functions of the same afford protection against the formation of calculi in the liver. He reports in detail the history of two cases of biliary disease in which he cleansed out the choledochus. In both cases the operation as such was successful, although in the second case death occurred on the seventh day after operation from causes not connected with the operation (croupous disease from which the patient had been suffering for years). In this case also secondary concretions of the liver were present. By these cases Rose shows that not only can calculi be removed from the cystic duct by his method, but also stones of medium size in the choledochus, which latter fact—difficult as it is to prove in the living—was determined beyond a doubt by observations and experiments at the post-mortem examination of his second case. This case also confirmed the correctness of his views as to the usefulness of the gall-bladder, in that it plainly showed how, owing to the disablement of the gall-bladder, dilatation of the other ducts results, which in turn gives rise to new secondary lithiasis in the extended branches of the hepaticus.

Fenger³ gives his latest views upon the surgery of the bile-ducts. He believes biliary colic to be a symptom common to the whole biliary tract, and states that there are three distinct factors to be considered in the causation of the pain: incarceration, inflammation, and retention.

Courvoisier, in 1890, showed that in the nine cases of gallstones reported in literature, in which death occurred during a paroxysm of biliary colic, there was a stone in the common duct in six, a large stone

¹ Chir. d. Leber and Gallenblase v. Langenbuch. Stuttgart b. Ferd. Enke, 1894, u. 1898, ii., S. 307.

² Deutsche Zeitschr. f. Chir., 1898, Band xlix, Heft 6.

³ Annals of Surgery, June, 1898.

in the gall-bladder in one, and stones in all parts of the biliary tract in one; in the remaining case no autopsy was performed. From this Fenger reasons that it is doubtful whether the cystic duct is more to be dreaded in this respect than the rest of the biliary tract. In regard to inflammation, he states that typical attacks of pain and fever, at intervals of months, are found in most instances of remittent attacks of inflammation of the gall-bladder. In certain cases Fenger believes that daily or weekly exacerbations of an existing subacute inflammation take place, not unlike a protracted nasal catarrh which gets better and worse at intervals. Retention of bile causes biliary colic, as a rule, when retention is sudden. In cases where the obstruction comes on gradually, colic is seldom present. Fenger believes that from the present state of our knowledge it is not possible in a given case of biliary colic to make a diagnosis from clinical symptoms as to which of these three factors is the cause of the pain. The character and shape of the stone passed by the bowels, in certain cases, may throw some light upon its point of origin. Stones with facets, Fenger believes, are ordinarily from the gall-bladder, where they occur in groups. Stones with two parallel facets are commonly from the ducts, where they lie in single rows. Spherical stones without facets, when single, may occur anywhere, but when multiple most commonly come from a dilated common duct. He reports a case in which there were attacks of biliary colic and icterus, but no tumor. At the operation the cystic, hepatic, and common ducts were dilated and filled with stones; the gall-bladder, which was small, also contained stones. Choledochotomy and cholecystotomy were performed, and the gall-bladder and ducts thoroughly cleaned out. The patient made a prompt recovery, and has been free from biliary colic since, a period of two years. He states that the duration of the operation was two hours and twenty minutes. It was tedious and difficult to extract all the stones. The openings both in the common duct and the gall-bladder were closed by interrupted sutures. The gall-bladder was fastened to the peritoneum; a drain was inserted into the wound of the gall-bladder and another into that of the duct. Although this case made an excellent recovery the bad results following closure of the common duct in Quenu's practice show that the operation is attended with considerable risk. This risk can be practically overcome if the gall-bladder be opened and sutured to the abdominal wall. The common duct should never be sutured, or at least in the majority of cases should not be sutured without taking this means of avoiding biliary intoxication.

Fenger again takes up the question as to whether or not the operation of cholecystotomy should be performed in one or two stages. He has long advocated dividing the operation into two stages, and while most

surgeons at present have abandoned the two-stage operation, he still believes in it and attempts to show why it should not be given up. Quoting Courvoisier's statistics, Fenger shows that the mortality of 10 per cent. is the same whether the operation be performed in one or two stages.

Kehr uses it only exceptionally, three times in one hundred cases. Riedel believes that it should be used in certain cases. Mayo Robson does not advocate it.

The chief objection to the two-stage operation is that it does not permit the surgeon to remove an impacted stone from the neck of the gall-bladder or from the duct. Thus, the operation for gallstones is imperfect, a second operation being required to remove the stones which cannot be gotten rid of through the fistula. Riedel believes that the two-stage operation is indicated in those cases in which there is a small, deep-seated gall-bladder which cannot be sutured to the parietal peritoneum. Fenger states that he does not feel like giving up the operation entirely, for the reason that the risks of infection of the peritoneum are less than if the operation is performed in one stage. He believes that it protects as certainly and surely in operations for suppurating gall-bladder as in operations for abscess in the liver. He has never lost a patient from the effects of an operation in two stages, while in one case of cholecystotomy in one stage, fatal cystic peritonitis followed. He states that when the object of a cholecystotomy is not so much the removal of stones from the biliary tract as the drainage of a cystic gall-bladder, in other words, a temporary operation to avert the danger of rupture, perforation, or sepsis, the two-stage operation is the only rational one.

If, when operating during an acute attack of cholecystitis there is found a small deeply seated gall-bladder adherent to the surrounding structures, he prefers to operate in two stages. He further states that in some of the most complicated cases—and complications are the rule rather than the exception, 72 of Riedel's 122 cases having been complicated—the local condition and the condition of the patient may necessitate the two-stage operation. Another advantage of the two-stage operation, in addition to that of safety in the complicated cases, is the fact that simple drainage of the gall-bladder not only relieves the symptoms, but brings about such changes in the inflammatory condition about the bladder that cedematous and infiltrated adhesions later become soft and pliable and the organ becomes movable, thus making the secondary operation much easier. In several cases Fenger has been satisfied with simply laying bare a square inch of the gall-bladder surface for the operation in two stages, and he adds that the majority of his cholecystotomies in two stages, although operations of

necessity, generally gave permanent relief. He believes that the young and inexperienced surgeon had better begin with the two-stage method, even at the risk of making an incomplete operation. As his experience enlarges he can gradually and with greater safety perform the operation in one stage.

This last-expressed view is undoubtedly correct, surgery of the gall-bladder being comparatively new. While Robson, Kehr, and a few others, by reason of their very great experience in surgery of the gall-bladder and ducts, may perform these operations at one stage with almost no risk, it would not be right to conclude that every surgeon with little or no experience can do the same.

In regard to the indications for operation, Fenger states that the operation is now performed earlier in the disease than formerly, when only the most desperate cases sought surgical aid. Repeated attacks of local inflammation increase the number and strength of adhesions, and, hence, greatly augment the difficulties of the operation, so that the earlier the operation be performed the fewer are the complications which the surgeon is liable to encounter and, consequently, the shorter its duration.

It is not fair, however, to suppose that the cases which prove to be the most difficult on the operating-table always give a history indicative of their true character. In cases of remittent attacks, Fenger prefers operating during the interval of rest, just as in appendicitis. If stones are being passed with the feces, he believes it better to await the result and see if relief does not follow. In support of this he cites a personal observation in which biliary colic had existed for four years, during the last two of which the patient was jaundiced. Recurrent attacks of colic, which were sometimes very severe, occurred once or twice every month, and during the last year almost every week. Finally, a very severe attack of biliary colic occurred, during which six stones were found in the feces. Spontaneous recovery ensued without operation, and no attacks occurred thereafter. I believe this to be an exceptional case; at the present time, given a number of similar cases, I believe better results would be obtained in those patients who submit to an operation rather than trust to time and nature. I will go even further and say that repeated attacks of biliary colic, much less severe than those described and less frequent and annoying, even without jaundice, would justify the surgeon in operating. As bearing upon this an unreported case recently occurring in the practice of Dr. M. L. Harris, of Chicago, may be cited: The patient was a woman, about thirty years of age, who had had for a number of years repeated attacks of biliary colic without jaundice, and without the presence of a tumor. Several prominent surgeons had advised against operation. Dr. Harris operated and found the gall-bladder filled with 170

stones. This patient would certainly never have been cured by medicinal treatment, and had she waited for a number of years it is fair to believe there would have been the danger of the development of the various complications which Dr. Fenger admits so greatly increase the difficulties as well as the dangers of the operation. Fenger insists upon the importance of removing all the stones. He states that Kehr was unable to find all the stones in five out of thirty cases of choledochotomy. He believes that the flexible metallic probe devised by himself, and made of spiral wire, is of very great value in detecting stones lodged in the bile-ducts. Robson prefers a slender scoop or, better, the finger.

As to the prognosis of choledochotomy Fenger believes that it is improving; the mortality in the 44 cases he collected in 1896 was 18 per cent.; he has operated upon 7 cases, with one death, 14.3 per cent.; Kehr upon 30 cases, with a mortality of 6.6 per cent.; Robson 49, with a mortality of 6.1 per cent.

Kehr and Riedel differ widely in their opinions as to the relative dangers of operations upon the cystic and common duct. Kehr operated twenty-three times upon the cystic duct without a death, while he had two deaths in choledochotomy. Fenger believes that the difficulty in operating upon the duct increases as we approach the duodenum.

Mayo Robson¹ reports a series of cases of choledochotomy including three of duodeno-choledochotomy. Robson's work upon the surgery of the gall-bladder and bile-ducts is second to none in the world, and his paper referred to contains his most recent views. The first operation upon the common duct was performed by Courvoisier in 1890. Robson states that at the present time it may confidently be said that there is no approach to the gall-bladder, cystic, or common or primary division of the hepatic duct which cannot, under ordinary circumstances, be reached for the removal of gallstones. In operating on the gall-bladder and bile-ducts he thinks it is important to begin prepared for any of the various operations on the biliary passages. In regard to the frequency of stones in the common duct, he differs from Courvoisier, who estimated the number at 4 per cent., and believes that from the surgeon's point of view 20 per cent. is not too high an estimate. In regard to the different means at our disposal for treating stones impacted in the common duct, he states that in a few cases the concretions may be manipulated backward into the cystic duct, and thence extracted by scoop or forceps. This is seldom practicable unless the cystic duct be much dilated. He has employed this method successfully in two cases. In a few cases a small stone may be forced onward into the duodenum, and cholecystotomy may be performed with the subsequent

¹ British Medical Journal, November 5, 1898.

treatment of the concretions by solvent injections of olive oil or soap solution. This procedure, he thinks, should be borne in mind on account of its simplicity and safety. In addition to the certainty of immediate relief the patient is put into a better condition for subsequent operation should such become necessary. With reference to crushing the stones in the duct, he has followed this method in thirty cases with marked success and with but one death. He considers this method applicable in cases where the common duct is difficult to reach and in stout subjects, or patients not capable of undergoing a prolonged operation. Here also some solvent solution may be injected into the ducts. As to needling through the duct walls, he believes the method not free from risk and hardly to be recommended. As regards cholecystenterostomy, he does not believe it an ideal operation; moreover, in the very cases in which one would be most anxious to use it the gall-bladder is usually found greatly contracted. Robson has performed the operation thirteen times with one death, which occurred in a patient who at the time was very ill from suppurative cholangitis and deep jaundice. Choledochenterostomy, or uniting the dilated common duct to the duodenum is seldom indicated. Robson's two cases both recovered. Choledochostomy, or attaching the dilated duct to the surface and draining it, is an operation seldom indicated and usually attended with fatal result. The ideal operation for stone in the duct, he believes to be choledochotomy, or incising the duct and removing the calculi. Duodeno-choledochotomy, or reaching the duct through the opened duodenum (McBurney's method), he considers a very useful modification of the operation in those cases in which the stone is located near the duodenal end.

In regard to the technique of the operation upon the common duct, Robson gives some very useful practical points. He believes that the oblique incision through the abdominal wall along the lower border of the right lobe of the liver gives the best access. A sand-bag under the loin brings the duct several inches nearer the surface, and is always employed. A vertical incision is made over the stone, which is then gently squeezed out or removed by forceps. Robson emphasizes the importance of clearing the ducts completely, otherwise the operation will be of no avail. In 16.6 per cent. of Kehr's cases some concretions were left behind.

Robson does not attach much value to the various probes devised for exploring the ducts, much preferring digital exploration where possible, or a slender, bent scoop where the duct is not capacious enough for the finger. In suturing the duct he uses either a rectangular cleft-palate needle or a simple round intestinal needle, usually discarding any needle holder. The first suture of catgut brings together the edges of the muscular and fibrous coats; the final sutures of silk unite the serous

coverings. Robson always uses a rubber tube and gauze drain, leaving them for twenty-four hours or longer, if needful. He states that generally he drains the gall-bladder at the same time, as in an ordinary cholecystotomy.

This point of draining the gall-bladder in operations upon the common duct has been little emphasized by Robson and scarcely referred to by other surgeons, and yet it is one of the utmost importance, as shown by the recent reports of Quenu and his collected statistics. Unless draining the gall-bladder be done, I believe with Quenu, that the common duct should never be sutured; all of his cases in which it was sutured showed evidence of biliary intoxication and ended in death, except those in which the sutures gave way. The operation adopted by Robson, suture of the duct with drainage of the gall-bladder, I believe to be the ideal operation, being safer and far more satisfactory than simple incision and drainage of the duct.

In regard to the method of operating through the duodenum, advocated by McBurney, Robson has used it three times, and believes it less difficult than it appears. In operating in this way no drainage is advocated. To counteract the tendency to bleeding which is always present in cases associated with long-continued jaundice, he prepares the patient by giving him chloride of calcium in one-half-drachm doses three times a day for a few days before operation, and, in addition to this, twenty-four to forty-eight hours before operation he gives the same drug in one-drachm doses in nutrient enemata three times a day, and he adds that since adopting this method of treatment he has had little or no trouble from hemorrhage either at the time of operation or subsequently. He strongly recommends its use. In regard to the prognosis of choledochotomy, Robson believes that it will improve with experience, but will always be more serious than simple cholecystotomy.

As evidence of how greatly the mortality is lowered by familiarity with the technique of the operation, the statistics of Robson and Kehr may be cited. While Kehr's 84 collected cases from all sources show a mortality of 37.8 per cent., his own mortality was only 6.6 per cent. Robson has himself operated on 49 cases, with 3 deaths, or a mortality of 6.1 per cent. In all of the three fatal cases jaundice had been long continued and deep, and, further, was associated with septic and suppurative cholangitis. Among his cholelithotrities there were no deaths, but in the 7 choledochotomies there was a mortality of 11.7 per cent.

Petersen,¹ of Heidelberg, gives a résumé of the work at the Heidelberg clinic in surgery of the liver and bile-ducts. Of the 162 operations performed at the Heidelberg Clinic a great proportion were for gall-

¹ Deutsche Gesellschaft für Chirurgie, XXVII. Cong. Centralblatt f. Chir., 1898, 143.

stones. There were 65 cystotomies, with two deaths, both deaths occurring in cancerous disease; 10 cholecystectomies with 2 deaths, 1 from secondary hemorrhage and 1 from peritonitis; 7 cysticotomies, with 1 death from peritonitis; 20 choledochotomies, with 4 deaths. Petersen states that the prognosis of this operation of choledochotomy seems to be particularly favorable when associated with cholecystotomy. In eleven cases anastomosis was made between the biliary passages and the intestines, five times for cancer, with three immediate deaths; six times for lithiasis, with one death. In all cases the anastomosis held; it was performed four times by means of Murphy's button. Petersen believes cholecystotomy performed at one sitting to be the operation of choice, holding that cholecystectomy should be reserved for those cases in which malignant disease is present. A return was observed only four times in eighty cases; 20 per cent of the cases operated upon were followed by ventral hernia. In eight cases of biliary fistula five were cured by a second operation. It appears that a persistent fistula will easily disappear by slight modification of the technique. The bladder is sutured to the parietal peritoneum and the drain fixed into the gall-bladder by suture. Bacteriological examination proves that the gall-bladder almost always at first contains micro-organisms (46 times in 50), but it is ordinarily sterile at the end of two to four weeks of persistent drainage.

REMOVAL OF BILIARY CALCULI OF THE COMMON DUCT BY THE DUODENAL ROUTE. McBurney¹ reports a most interesting case of removal of a gallstone, impacted in the common duct, by means of an incision through the duodenum. This operation was devised by McBurney six years ago, since which time he has performed the operation on six occasions. One patient, who had always suffered from an irritable stomach, died after prolonged and uncontrollable vomiting without any evidence of sepsis. He believes that the operation has a very important place in gall-bladder surgery, and one as yet not sufficiently appreciated. He states that to a gallstone lying in the common duct at any point in the upper two-thirds, the approach through the wall of the duct is not difficult. When a stone is located in the extreme lower end of the passage, or when it can not be dislodged to a place higher up in the duct, its removal without opening the intestine is attended with great difficulty and much danger. Under these conditions, McBurney believes, the stone should be removed through the duodenum. The advantages of this method are the comparative ease with which an incision in the anterior wall of the duodenum may be closed by suture; the greater safety and more rapid recovery

¹ *Annals of Surgery*, October, 1898.

from operation. McBurney would employ this method in all cases in which the calculus is located anywhere from the termination of the cystic duct to the entrance of the common duct into the duodenum. He states that the orifice of the duct is very easily dilated, and it may be freely incised for at least half an inch with perfect safety. Still another advantage is urged, namely, that by the introduction of a probe bile-ducts can be examined for a long distance upward toward the liver and, furthermore, the chances of leaving behind fragments of gallstones and inspissated bile are fewer than when the usual methods are employed.

I believe this method of McBurney's will prove of great value, and it certainly merits a more extended trial; it has already been employed by Kocher, Robson, and others.

SURGERY OF THE LIVER.

Tumors of the Liver. Keen¹ reports a case of successful removal of an angioma of the liver by elastic constriction external to the abdominal cavity, and also gives a résumé of the histories of fifty-nine cases of operation for tumors of the liver. In his own case the size of the tumor was 7.5 cm. by 6.5 cm., and was so vascular that it was thought unwise to attempt to remove it by the knife. Incisions were made on either side of the tumor through the liver tissue, thus making an artificial pedicle. An elastic rubber tube was passed around the pedicle, firmly tied, and the wound was then closed with the exception of a space large enough to permit the tumor to be drawn outside the abdominal wall; iodoform gauze was carefully packed about the wound and pedicle. At the end of forty-eight hours the tumor was much shrunk. On the sixth day the rubber ligatures were removed and the small remaining pedicle was divided with scissors without any hemorrhage. This was the second case of resection of the liver, the first having been an adenoma of the bile-ducts.² This case was well five and a half years later. The first case of resection of the liver for tumor Keen believes to have been that of Lius in 1886; Langenbuch's, in 1888, the second.

Keen was able to collect 59 cases: from 1886 to 1892, 21 cases; from 1892 to 1897, 38 cases. Of this number only 9 were operated upon by American surgeons, and 50 by Europeans. The mortality of the 59 cases was 15.5 per cent.; 7 cases having died of shock and hemorrhage, and 2 of septicæmia; 42 of the cases were women; 9 men. This great disproportion is explained by Keen as due to the constriction of the chest in women by tight clothing.

¹ Pennsylvania Medical Journal, October, 1897.

² Boston Medical and Surgical Journal, April 28, 1892.

As to the duration of life after removal of the tumors, several cases of carcinomatous tumor were well for from two to seven years after.

The pathological character of the various growths was as follows :

Syphiloma	11
Carcinoma	10
Adenoma	6
Sarcoma	4
Angioma	4
Echinococcus cysts	14
Various	9

On account of the serious danger of hemorrhage, even from small punctures, the liver should never be aspirated except after opening the abdomen. Ricard and Broca¹ have reported fatal hemorrhage after aspiration.

The four methods of checking hemorrhage are freely discussed by Keen. They are :

1. Ligation.
2. Gauze packing and hot water.
3. Paquelin cautery.
4. Elastic ligature.

In many cases two or more of the methods have been employed.

The various forms of ligature have been fully discussed by Kousnetzoff and Pensky,² and also very recently by Terrier and Auvray.³ It has been shown that the individual vessels are very strong, and can be tied singly. The veins are stronger than the arteries. Keen and Eliot were both able to tie several large vessels before cutting them, and this method was used by Lilienthal,⁴ who first passed two transfixion sutures of thick catgut through the liver, well behind the nodule, and tied them loosely so as not to cut through the peritoneal coating of the liver. An incision was then made outside the suture, and this portion of the liver removed. By cutting very carefully, a little at a time, the bloodvessels appeared like white glistening cords, and they were caught and tied before division. There was absolutely no bleeding, and the transfixion sutures were left in place. A piece of gauze was placed over the liver and a large piece of rubber tissue next the intestine.

Willy Meyer⁵ also reports a successful case of removal of tumor of the liver by ligature and cautery. The hemorrhage was slight, but it was found impossible to remove the entire tumor, and speedy recurrence followed.

Keen states that in ligating vessels in the liver it is very important to

¹ *Revue de Chirurgie*, March, 1897.

² *Ibid.*, 1896, pp. 501 and 954.

³ *Ibid.*, September, 1898.

⁴ *Annals of Surgery*, March, 1899.

⁵ *Loc. cit.*

tie the knot slowly, since, if it is tied quickly, it will cut through the hepatic tissue. He would, however, place little reliance upon the use of gauze and hot water.

As regards the Paquelin cautery, Keen believes it most valuable, especially when it is desirable to cut into the liver-substance to make an artificial pedicle. If used the lowest heat (dull red) must be employed.

The elastic ligature has been used by ten surgeons, among whom were Terrillon, Küster, Czerny, Mayo Robson, Israel, Tricomi. In all of these cases it proved most satisfactory, though one case, Küster's, died of septicæmia. Küster adopted a very ingenious way of applying the elastic ligature, viz., by first passing a canula, and through this introducing two elastic ligatures. If the elastic ligature be used the stump should be treated by the intraperitoneal method when possible.

Keen's conclusions, which seem to be fully warranted by a study of the cases thus far reported, are, in brief:

1. That tumors of the liver, and even large portions of the liver, may be resected without serious disturbance of its function.
2. Escape of bile into the peritoneal cavity is rare after this operation.
3. The chief dangers are hemorrhage and sepsis.
4. The removal may be made by any one or by a combination of the methods described.
5. If the tumor be possibly syphilitic, corresponding treatment should be first tried before operation.
6. In case of doubt, exploratory operation is justified.

Terrier and Auvray¹ collected forty cases of tumor of the liver treated by various operations. In eight cases an attempt was made to perform a complete and radical operation for malignant disease of the liver. In twenty cases there were three angiomatous tumors, three of a doubtful nature, and nine syphilitic tumors. In six cases death occurred as a result of the operation, due either to sepsis, shock or hemorrhage. The latter, it is stated, can usually be readily controlled by improved methods of operation, and especially by intra-hepatic ligature. The operations for malignant disease were followed by speedy relapse in most instances, although in a few cases the patient remained free from a recurrence for from two to three years.

Disease of the Liver and Gall-bladder. In 300 operations upon the liver and bile-ducts, Mayo Robson² has only met with three cases of tumor of the liver in which it seemed wise to attempt complete removal of the disease. One case died of shock, the other two recovered and died a few months later from a recurrence of the disease. The hemorrhage was controlled in the first case by employing two knitting-needles and a drainage-

¹ *Revue de Chirurgie*, September, 1898.

² *British Medical Journal*, October 29, 1898.

take as an elastic ligature. The diseased portion of the liver with the gall-bladder were brought out of the external wound, and the needles were passed through the liver and cystic duct transversely, resting on the skin at either side and preventing the elastic ligature from slipping off the stump. The projecting lobe of liver, with the remainder of the gall-bladder and cystic duct, was cut away one-half inch above the needles, there being no bleeding and very little tension. The stomach was dusted with borie powder and dressed daily. The first needle came away at the end of a fortnight, the second a week later, while the stump, together with the ligature itself, was removed within a month.

In the second case (cancer of the gall-bladder and liver) the right border of the liver, which projected well below the ribs, together with the gall-bladder and cystic duct, was dragged out of the external wound, and the knitting-needle and elastic tourniquet were used as in the preceding case. The patient regained flesh and strength, but died about six months later from recurrence of the disease.

In a third case of cancer of the gall-bladder infiltrating the liver, a similar operation was performed, but the patient died of shock. In this case the omentum, colon, and duodenum were adherent and thoroughly infiltrated with cancer.

As regards the propriety of operation in such cases, Robson states that partial hepatectomy with cholecystectomy is certainly feasible; but as to the question, Is it worth the anxiety and danger? he believes that further experience is required before the answer can be finally given. The fact that a very large percentage of cases—90 to 100 per cent.—of primary cancer of the gall-bladder is associated with gallstones supports so strongly the theory of gallstone irritation producing primary cancer of the gall-bladder and liver, that Robson believes it ought to have great weight with us in advising early surgical treatment of cholelithiasis.

This is certainly the logical view, and now that Robson, Kehr, and others have proved that the operations for simple cholelithiasis are practically without risk, I believe that when the diagnosis has once been thoroughly established, surgical treatment is indicated.

Robson's conclusions are as follows:

1. Seeing that statistics from various countries and by many observers agree in showing the frequent association of gallstones and primary cancer of the gall-bladder and liver, it is desirable that cases of cholelithiasis should be submitted to surgical treatment at an earlier stage than has hitherto been the custom.

2. In all cases of tumor of the gall-bladder, even if unaccompanied by symptoms, an operation should be advised, and the obstruction, usually a calculus, should be removed.

3. If these rules were followed, primary cancer of the gall-bladder and liver would probably be less frequent.

4. If early operation in cases of tumor of the gall-bladder was followed out, even if primary cancer had commenced it could be caught in an incipient stage when a complete cure by partial hepatectomy might be reasonably hoped for.

5. An exploratory operation, even in a patient seriously ill, with a localized tumor in the gall-bladder region, is worth advocating though malignant disease be feared, in the hope that the disease may be inflammatory, and so capable of relief.

6. If there are any secondary nodules in the liver, or if adjoining viscera are invaded, the operation had better be terminated as a simple exploratory one.

Abscess of the Liver. Fontan³ discusses the very important subject of the treatment of abscess of the liver. He states that during the past twenty years he has studied 150 cases of abscess of the liver, and has operated upon fifty cases in which he followed a method he brought out about twelve years ago before the Société de Chirurgie, of Paris. This method consists, in brief, of three steps:

1. A very large opening is made in the region where the presence of pus has been determined.

2. A suture "pleuro-pleural" is made if one traverses the pleura, and "hepatico-peritoneal" if one does not go through the thoracic cavity.

3. A large incision in the liver with systematic, careful, and thorough curettage of the abscess-cavity.

Fontan regards the place of election for the external incision as the anterior axillary line, or a little behind it, and on a level with the eight, ninth, or tenth rib, which should be resected for a distance of 6 to 8 cm. The advantages of this incision, he believes, are that it offers the most favorable conditions for drainage, and severe hemorrhage is less likely to occur. He always prefers the transpleural routes when possible, and for curetting employs the ordinary uterine curettes. The fact that curetting produces neither hemorrhage nor the flow of bile is due to the thrombosis always present. The curettage greatly hastens the period of convalescence.

In 1895 Fontan published twenty-one cases treated by his method, with seventeen cures, and since that time he has operated upon thirty-one further cases, with but one failure, or a total of fifty-two cases with four deaths, and with 92 per cent. of cures.

These results are, I believe, superior to those obtained by any other

³ Bull. et Memoires de la Société de Chir., March 1, 1899, p. 157.

method of treatment, and the method certainly commends itself as based on sound surgical principles.

Echinococcus Cysts. The diagnosis and operation for echinococcus tumors must be considered as one of the most interesting subjects in abdominal surgery. While, as Most⁴ correctly states, the parasite frequently lives, grows, and occasionally dies again without being noticed by the individual, there are, on the other hand, cases where this cysticercus causes serious trouble, often endangering the health and even the life of the patient. Numerous methods for the treatment of this treacherous disease have been devised from time to time. Out of timid attempts to cure the trouble by means of puncturing, more heroic methods of operation have been gradually evolved until it is now the aim of surgery to free the patient from the unwelcome invader by one stroke. However, the more heroic the procedure, the more important is it that the diagnosis should have been correctly made, and this, as Most points out, is connected with grave, in some cases almost insurmountable, difficulties, on account of the great variations in the clinical aspects of the disease.

The seven cases exhaustively reported by Most well demonstrate the many difficulties which may confront the surgeon in correctly diagnosing and operating on the different cases. Not only the pathological changes in and around the echinococcus sac, but also the various localities where it may be found, enter into the question.

From a survey of the seven cases mentioned, Most arrives at the following conclusions :

As regards the biological changes of the echinococcus itself, it is mainly the inflammatory changes in and around the cyst, the relation of the parasite to the bile-ducts, its spontaneous extinction, and the bursting of the cystic walls, that come into consideration. Obliteration of the parasite as well as inflammatory changes in and about the cyst are more common. In rare cases, however, a long extinct parasite may become infected and grave sepsis may occur, greatly endangering the life of the patient. All methods, therefore, whose object it is merely to kill the worm without removing it, should be carefully limited to healthy and small bladders.

A complication worth mentioning is that of profuse biliary flux. While this is of no great consequence, as a rule, it may if continued for a long period, and in cases where the existing icterus does not disappear after operation, give rise to serious apprehension. If proper diet does not overcome this, and the general condition does not improve, local therapeutic interference may be attempted.

⁴ Deutsche Zeitschr. f. Chir., 1898, Band xlviii, Heft 2 and 3.

Rupture of the echinococcus wall with evacuation of non-infected cystic fluid into the abdominal cavity, while not infrequently passing off without dangerous consequences, is to be considered as a serious occurrence which may often result in death.

The echinococcus generally extends toward the abdominal cavity in its growth. If no complications be present, the diagnosis is comparatively easy, though inflammatory processes in the neighborhood and symptoms of pressure upon the adjoining organs may be misleading.

Subphrenic echinococci when developing within the bony space of the thorax present still greater difficulties in diagnosis and treatment. Their prognosis is very bad.

Puncturing is to be avoided as much as possible. If done it should be followed by operation at an early date.

As regards operation, the one-stage and the two-stage methods may be employed, and both were used in the cases reported by Most.¹ The one-stage operation is suitable for cases where clinical appearances seem to point to an echinococcus of non-infectious contents, or where rapid procedure is indicated in view of the condition of the patient, and also where the serosa is securely protected by adhesions. In cases where the echinococcus has developed in the posterior concavity of the liver it will probably become necessary to sever broader layers of liver parenchyma on account of the displacement of the liver.

INTESTINAL ANASTOMOSIS—THE VALUE OF MECHANICAL AIDS.

Murphy's Button. Frederick Treves,² in an address on "The Rudiments of Intestinal Surgery," discusses the relative value of the various methods of intestinal suture and anastomosis. In regard to suture he states that many intestinal sutures are hopelessly bad, and others hopelessly complex and of interest only to those who find delight in ingenious puzzles. He believes the best stitch is still the ancient one, which includes a fine continuous suture of the mucous membrane, and the Lembert, which involves the other coats of the viscus. As regards the various devices for uniting the divided bowel or for performing lateral anastomosis, he states that the method of simple suture is theoretically the best, though in practice it can seldom be advantageously employed. He states that in 1882³ he described a method of suturing the bowel over a collapsed India-rubber bag, which was sausage-shaped and was

¹ It must be one's principal aim to protect the abdominal cavity against the intrusion of cystic fluid.

² British Medical Journal, November 5, 1898.

³ Medico-Chirurgical Transactions, vol. xlviii. p. 55.

introduced into the ends of the gut to be united. Further experience with the bag, however, convinced him that it was useless, and he soon discarded it.¹ He is somewhat surprised to see this method revived by Halsted sixteen years afterward.

Of all the appliances in vogue for uniting the divided bowel, he considers Murphy's button the best. He has employed it in over fifty cases with very satisfactory results. He has never known the button to induce gangrene which has extended beyond the limits of the button. The two undoubted objections to the button, he states, are (1) that it may be indefinitely retained; (2) that its separation may be followed by contraction of the artificial opening. In cases of cholecystenterostomy in which he has employed it he has never known it to be retained. The same is true of operations upon the colon. With regard to gastro-enterostomy, in which the button is used, he states that retention of the button for considerable periods, or absolute failure to appear at all, seems to be the rule rather than the exception. In not a few instances there has been undoubted contraction of the artificial opening. He states that in only two cases of gastro-enterostomy in which the button was retained did the instrument cause trouble. One patient had made a perfect recovery and gained forty pounds in weight. About a year later the patient was seized with severe epigastric pain after bicycling. The skiagraph showed very distinctly that the button was still present in the stomach, and a month later Treves opened the stomach and removed the button, which was quite loose. The patient's recovery was complete.

In the second case the patient also recovered well from gastro-enterostomy and remained so for nine months, when, after a few days' pain in the abdomen, an abscess containing feces broke through the parietal wall. A fecal fistula has since continued. In this case the button seems to have lodged in the lower ileum, but owing to complications had not been removed at the time of the report.

This experience of Treves, that the button seldom causes trouble, even when dropping back into the stomach, is quite at variance with the statement of Price,² who says that when the button has gone the wrong way it will stay and ulcerate, and the complication ends the patient's life. Weir would not operate unless there was some evidence that the button was causing trouble.

I believe that if the button has not been passed after a reasonable period, for example, three to four months, an attempt should be made to locate it by means of a skiagraph, and when located gastrotomy or enterotomy should be performed for its removal. This operation should be attended with very slight risk.

¹ See his book on Intestinal Obstruction, 1884.

² *Annals of Surgery*, March, 1899, p. 305.

Jordan, of Heidelberg, employs the Murphy button in Czerny's clinic in all possible cases, and he believes that this instrument permits of far more rapid work than is possible by any of the methods of suture. He states that he can very easily do a gastro-enterostomy in fifteen minutes with the Murphy button. He believes that the proper use of the button is attended with no risk. In the early cases in which he employed it he had three deaths, but since he has given up its use in the large intestine he has employed it in more than one hundred cases without a single failure. It is important, he considers, to fasten the button firmly together, and in most cases he believes that subsequent suturing is entirely unnecessary. In certain cases the button has been passed the seventh or eighth day, but, as a rule, it has not been observed until the twentieth day or later.

Jordan has performed 83 gastro-enterostomies with the Murphy button; in 63 cases for cancer of the pylorus; in 20 for non-malignant stenosis. The mortality was only 12.5 per cent. He is a strong advocate of posterior gastro-enterostomy, or Von Hacker's method, having employed it in 78 of the 83 cases.

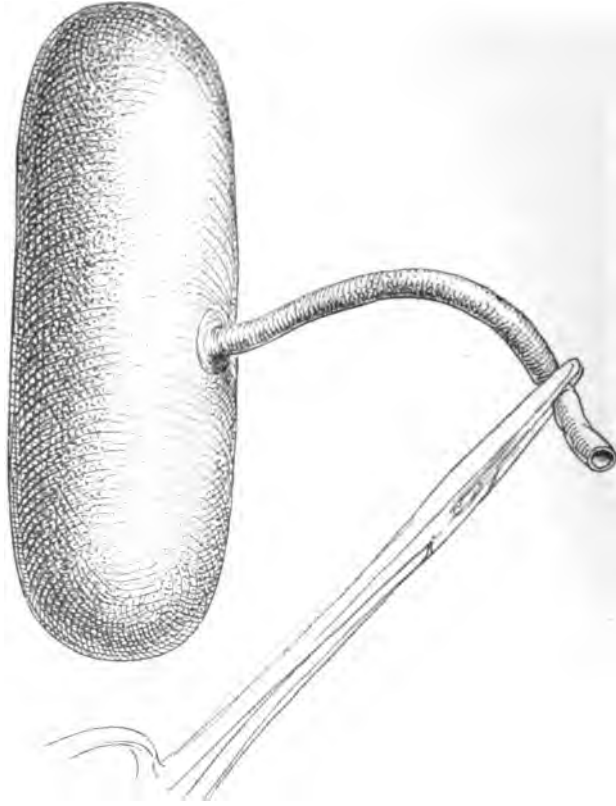
Tuffier, of Paris, who has had a large experience in intestinal surgery, does not employ the Murphy button. He has operated upon 62 cases of surgery of the stomach, 50 gastro-enterostomies and 9 pylorectomies. In the 9 pylorectomies there were 3 deaths and 6 cures. He also favors posterior gastro-enterostomy, and in all operations uses direct sutures without mechanical aid of any kind. The mortality of his cases of gastro-enterostomy is not stated.

Inflated Rubber Cylinder for Circular Suture of the Intestine.

In the *Johns Hopkins Hospital Bulletin* for February, 1898, Dr. W. S. Halsted advocates the use of inflated rubber cylinders in all cases in which it is desirable to perform end-to-end anastomosis of the bowel. Halsted states that in his opinion the license to practice general surgery should be withheld from those who have not practised on animals the operation for circular suture of the intestines and intestinal anastomosis. In support of this opinion he cites the case of a surgeon who, after considerable practice in intestinal surgery upon dogs, at length ventured to operate upon man, the operation requiring five hours for its performance. Halsted adds that the operation was successful, but states that it would not be difficult to predict what the result would have been had the practice on dogs been omitted. Halsted's article contains very complete and beautiful illustrations of the rubber cylinders and the manner in which they should be used. Two stitches, called presection stitches, are introduced on either side of the portion to be removed. The intestine is then carefully divided with scissors as close to these stitches as

possible. The rubber bag is introduced in a collapsed state, then slowly inflated by means of a syringe which is attached. From ten to twelve interrupted mattress sutures are then introduced; two mattress sutures that have not been tied are drawn on one side of the hook and the collapsed bag is easily withdrawn.

FIG. 16.



Halsted's inflated rubber cylinder.

The advantages of the rubber cylinder, in the opinion of Dr. Halsted, are as follows:

1. The vermicular action of the bowel is arrested over the bag, and the stitches can, consequently, be placed at regular and proper intervals.
2. The distended bag unrolls and spreads out to a fine edge over the everted raw edge of the intestine, enabling the operator to place the stitches with great precision at the desired distance from its edge.
3. If the distended intestine is to be sutured to collapsed intestine, or

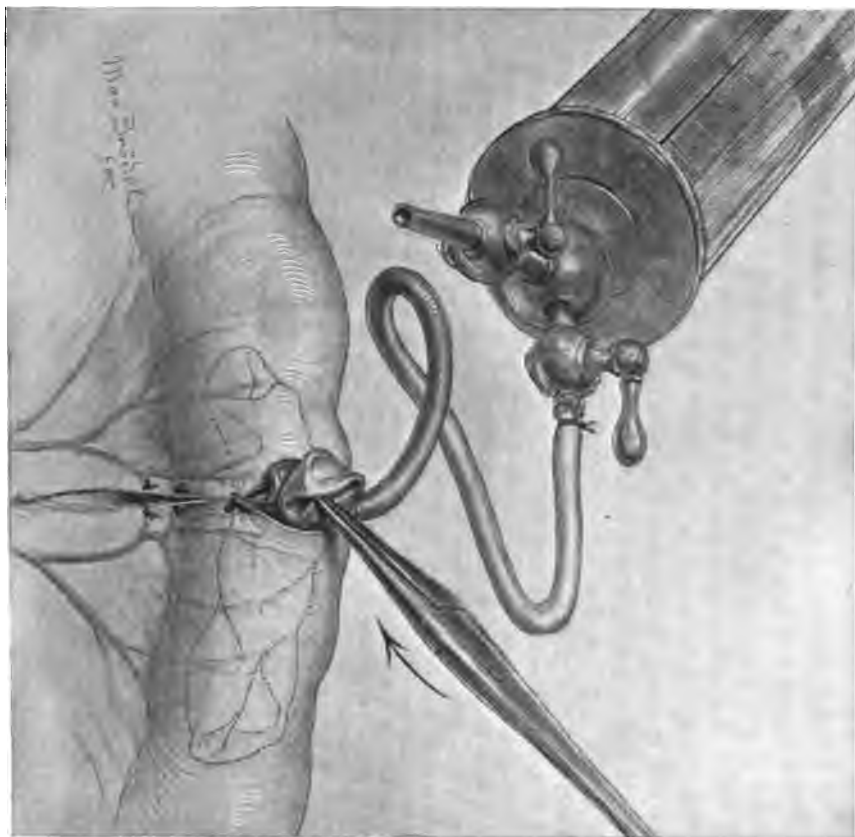
intestine of larger to intestine of smaller lumen, the smaller may easily be expanded to fit the larger piece.

4. But very little handling of the intestine itself by the operator is necessary.

5. The cylinder takes the place of at least two assistants.

6. It prevents the escape of intestinal contents, and hence dispenses with the injurious clamps or with the fingers of the assistants.

FIG. 17.



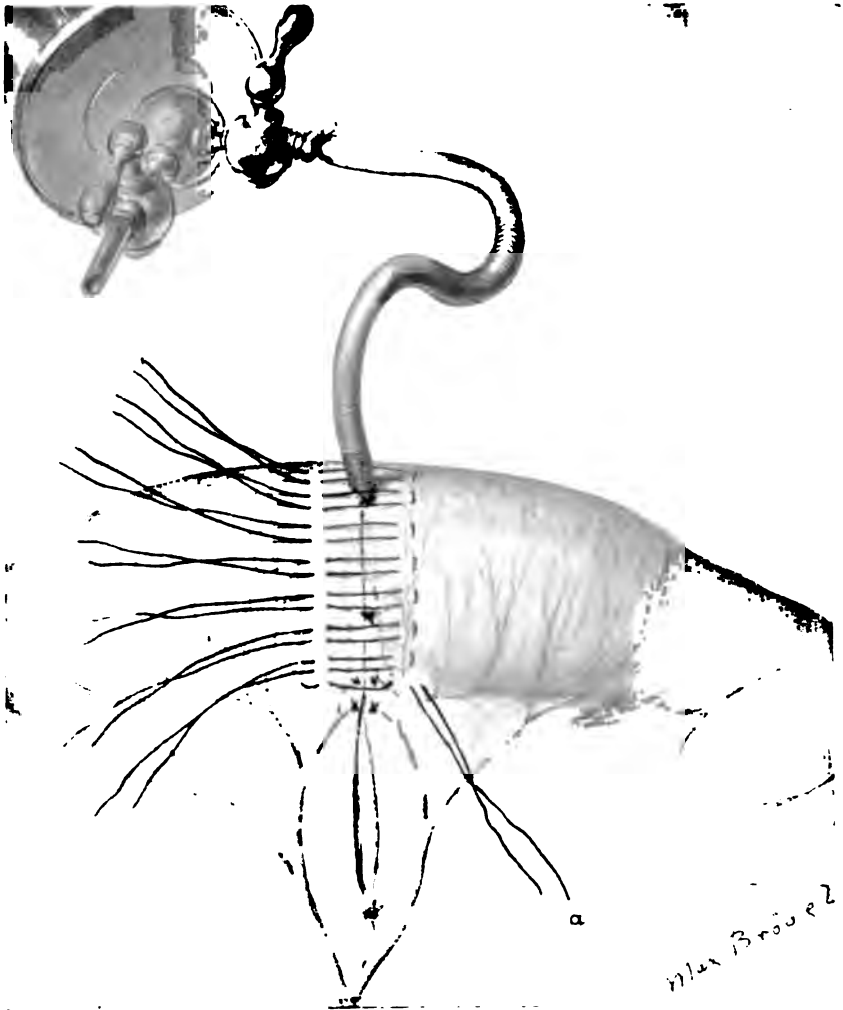
Halsted's inflated rubber cylinder in place.

7. The entire operation, exclusive of suture of the abdominal wall, can be performed on dogs in from five to six minutes, and probably in less time.

He believes the result should be better than that of any other method hitherto devised.

Whether or not this method will prove of great practical value is a matter of some doubt.

FIG. 18.



Halsted's inflated rubber cylinder in place after suture.

Laplace's New Forceps for Intestinal Anastomosis. Laplace, of Philadelphia, has recently devised a new forceps for facilitating the performance of end-to-end suture of the intestine and gastro-enterostomy. This forceps was exhibited before the Surgical Section of the American Medical Association in Denver, June 7, 1898, and has been more recently and more fully described in the *Annals of Surgery* for March, 1899. The accompanying illustrations give a clear idea of the method of construction as well as of the manner in which the forceps is used. To quote from the inventor: "The forceps consists of two rings which

are introduced into the intestine to be anastomosed, and act as supports to the parts while suturing them. The forceps being separable into two halves, can be gently withdrawn from a small aperture still unsutured, and anastomosis is completed by adding one or two sutures." The advantages of this method as set forth by Laplace are as follows :

FIG. 19.

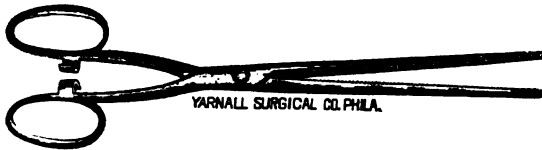


FIG. 20.

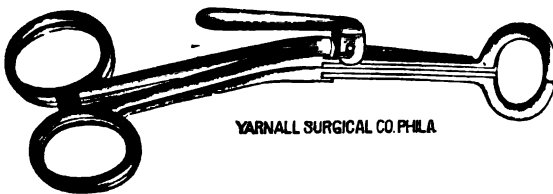


FIG. 21.

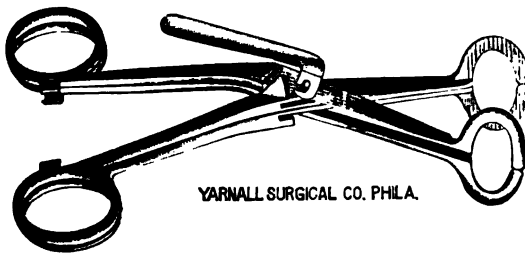
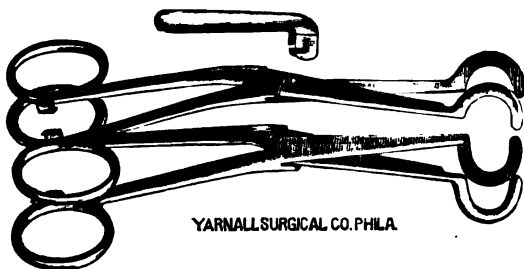


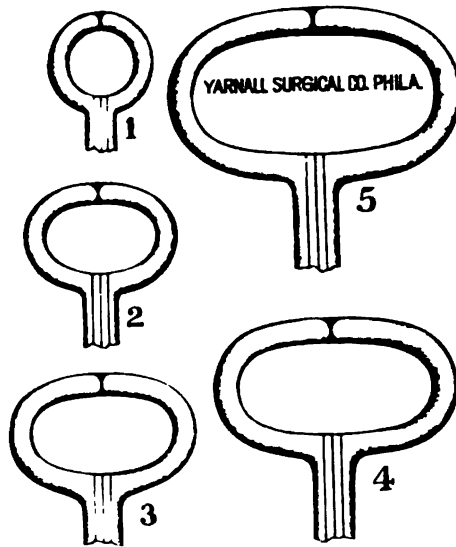
FIG. 22



Forceps for rapidly closing ends of divided intestine.

1. Rapidity and accuracy of suture without leaving any foreign substance in the gut.
2. Absolute control of the field of operation by means of the handles of the forceps.

FIG. 23.



Forceps for rapidly closing ends of divided intestine.

3. The facility with which the forceps is applied prevents the escape of intestinal contents during operation.

Five sizes are made, so that the forceps may be used for intestines of various calibre as well as for cholecystenterostomy. When performing end-to-end anastomosis after a portion of the bowel has been resected, the two ends are first united by a fixation stitch at four points. It is stated that this insures the right relation of the mesentery to the two ends of the gut. The forceps is then introduced between two of these stitches. The blades are then opened partially, so that one penetrates one end, the other the other end. The serous surfaces of the two ends are then inverted or pushed in. This may be facilitated by drawing a thread around the united ends between the two blades. The forceps is then clamped, bringing serous membrane into apposition to serous membrane. Sutures are then applied all around the clamped surfaces up to the point where the forceps enters the gut; the clamp is then removed, making it possible to remove one-half of the forceps through the small end suture opening. The other half is then removed and the operation completed by adding one or two stitches to the opening through which the forceps has been withdrawn.

The forceps may be used with the same facility in performing gastroenterostomy. In this operation an incision is made in each part to be anastomosed, about the length of the diameter of the rings to be used. One blade of the forceps is then introduced into the stomach, the other into the intestine. The two blades are then closed, and continuous or

interrupted sutures may be applied exactly as already described in the end-to-end anastomosis.

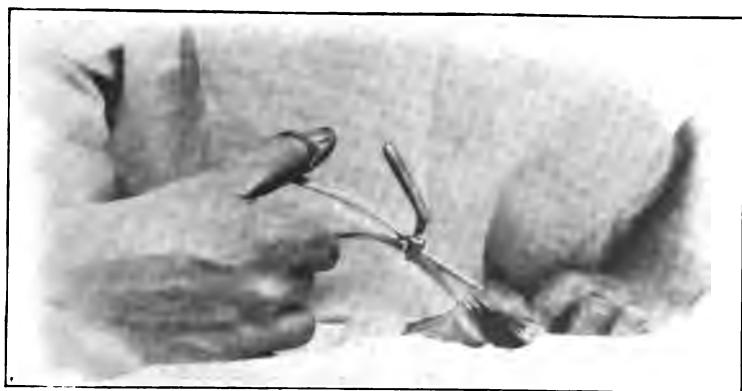
FIG. 24.



Gastro-enterostomy. One blade of forceps has been inserted into the stomach.

In a discussion as to the value of the forceps at the Philadelphia County Medical Society, November 5, 1898, J. Chalmers Da Costa stated his belief that the forceps had all the advantages to be gained

FIG. 25.



Gastro-enterostomy. Both blades are inserted in the parts to be approximated.

from such devices as the Murphy button, bone plate, etc., while it is free from the disadvantages of the latter, and he believes it is destined to replace the mechanical aids of other methods. Similar views were expressed by Drs. Horwitz, Martin, Rodman, and others.

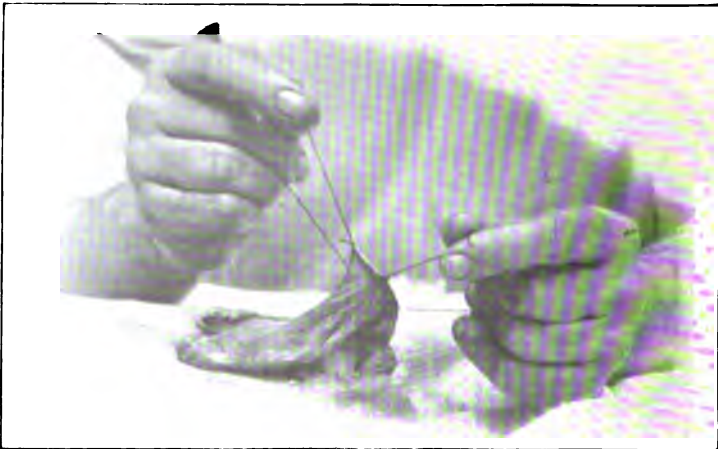
This forceps is certainly a most ingenious instrument, and, judging from what I have seen of its use in the skillful hands of Dr. Laplace

FIG. 26.



Gastro-enterostomy. Sutures have been applied circularly; the clamp is removed, loosening the forceps.

FIG. 27.



End-to-end anastomosis. Four fixation sutures are applied at the cardinal points, uniting the ends to be approximated.

upon the intestine of the dog and human cadaver, I believe it will prove a most valuable and practical addition to our list of mechanical aids. I do not believe, however, that it will entirely displace the Murphy

button, chiefly for the reason that it requires more time. It has, however, a large field of usefulness in those cases in which the slight difference of time is not a matter of importance. Personally, I prefer simple

FIG. 28.



End-to-end anastomosis. The forceps is introduced between two sutures, and one blade is made to pass into each gut.

FIG. 29.



End-to-end anastomosis. The forceps is clamped, bringing serous membrane to serous membrane; sutures have been applied circularly.

FIG. 30.



End-to-end anastomosis. One-half of the forceps is being removed from small unsutured opening.

suture without any mechanical aid, especially in end-to-end anastomosis. As a possible objection, at present theoretical it is true, should be mentioned the large amount of tissue that is infolded between the blades of the forceps. This would cause more or less of an annular septum, which in certain cases might cause more or less obstruction. We know that even two rows of Czerny-Lembert sutures have caused annular constriction sufficient to produce obstruction. To adjust the edges so accurately that a very small amount of bowel wall is infolded would require as much time as simple suture. Although an equal amount of tissue may be infolded between the surfaces of the Murphy button, the latter causes pressure-necrosis, and this entirely disappears.

Harris' Method of Circular Enterorrhaphy. The following method, though brought out by M. L. Harris, of Chicago, in 1892,¹ has not yet received the attention I believe it deserves. A method almost identical has very recently been proposed by Skelly.² Harris' method is best shown by the accompanying illustration.

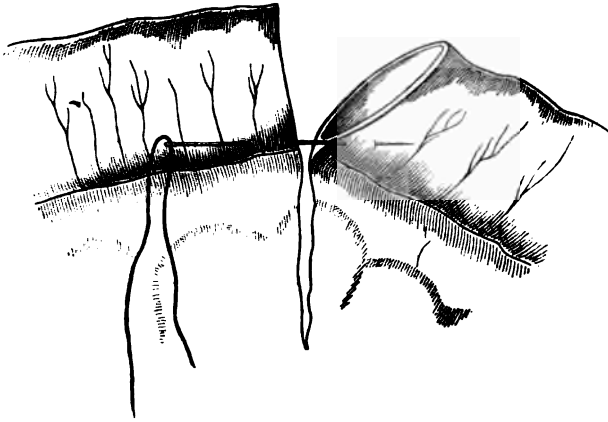
The direction having been determined, the loop is gently stripped of its contents and a light elastic or gauze ligature placed above and below. It is then divided transversely, taking care to preserve the mesentery

¹ Chicago Medical Recorder, September, 1892; and recently, *ibid.*, vol. xii.

² Annals of Surgery, 1898.

well up to the edge. The distal end of the bowel is now denuded of its mucous membrane for the distance of 1.5 to 2 cm.

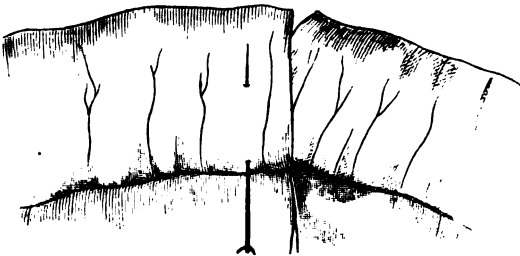
FIG. 31.



Harris' method.

The mucosa is very soft, and is very easily removed by simply scraping it off with a sharp curette. The submucosa is so tough that there is no danger of wounding it. Care should be taken that all the mucosa be removed, but the difference between the soft, pulpy mucosa and the smooth, tough submucosa is so apparent to the eye that there is no difficulty in accomplishing this. The hemorrhage attending this removal is slight, and soon ceases. The eversion of the mucosa of the proximal end is overcome by simply dilating it a little, as above described.

FIG. 32.

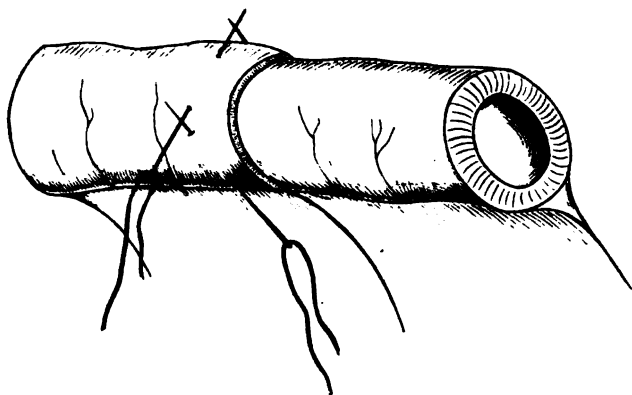


Harris' method.

Next comes the invagination of the proximal into the distal end, and while this procedure is somewhat difficult to describe it is very simple and easy to execute when once seen or understood. Three ordinary round sewing-needles of a good length are threaded with fine sterilized silk. The first needle is made to transfix the thickness of the lower or

denuded end of the bowel just to one side of the mesentery and at the inner limit of the denudation. It is not drawn clear through, but only until the point projects from the calibre of the bowel a little beyond its free edge. The point of the needle is made to pick up a bit of the other

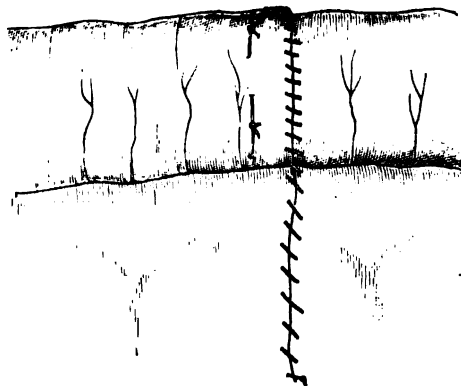
FIG. 33.



Harris' method.

end of the bowel, transversely, just to one side of its mesentery and very near to its edge (Fig. 31). Now, by drawing the needle back a little and using it as a lever by turning it around its point of transfixion in the

FIG. 34.



Harris' method.

lower end, it will be readily seen that the upper end, on this side, is invaginated into the lower end as far as the part is denuded of its mucous membrane. The point of the needle is then pushed on through the lower end from within outward a short distance in a line trans-

versely, where the needle is left temporarily, transfixing the bowel and holding that part of the upper end invaginated (Fig. 32). The same process is repeated with the second needle at a corresponding point of the bowel on the opposite side of the mesentery, while the third needle is used similarly at the part of the bowel opposite to the mesenteric attachment (Fig. 33). The needles are successively drawn through and the stitches tied, thereby permanently fixing the invaginated end to the inner limit of the denudation. The stitches should not be too long nor so tightly tied as to pucker the bowel. While three were originally used and described—and they are sufficient in the thicker and smaller gut of the dog—perhaps more are advisable, according to the size of the bowel, in the human subject. Their object is to keep the end of the intussusception in accurate contact with the intussuscepsus by an interrupted or continuous suture. The exposed end of the bowel is now stitched to the invaginated part, care being taken not to penetrate the inner lumen of the gut. Two or three sutures are taken on either side of the mesentery.

Harris has used this method in two cases, one a multiple gunshot wound of the intestine, in which the number and severity of the lesions were sufficient to account for non-recovery; and the other, also a very complicated case, was successful. The entire time occupied in the intestinal part of the operation was only fifteen minutes.

Harris, in 1892, pointed out the error of the common opinion that it is essential or even important to bring serous surfaces together in intestinal surgery. This question was discussed by Greig Smith,¹ who said “during the past two years I have deliberately and intentionally, when possible, acted as if the axiom were an error, and the result of experience has been to convince me that for all purposes, when sound, speedy, permanent union is desired, the apposition of intact serous surfaces is a surgical mistake.” It is on the second or third day in sero-serous union that leakage takes place. A sero-fibrous junction that lasts for a day is safe forever, for it goes on improving in strength and solidity.

In regard to mechanical aids, especially the Murphy button, Harris is a strong advocate of simple suture. He states that the apparent simplicity of the mechanical devices have led, as König predicted, to their use by persons unfamiliar with ordinary intestinal technique. Kummel² says: “The technique of Murphy’s button is not so simple, and resection of the stomach and bowel without suture still demands a thorough practice and experience.” Kummel himself prefers well-applied suture for all cases when it is not necessary to hastily complete the operation. Harris states that the most recent statistics as to the

¹ *British Medical Journal*, 1895, i.

² *Arch. f. klin. Chir.*, Band liii., Heft 1, S. 89.

results of Murphy's button in intestinal resection are those of Brentano,¹ which show 48 deaths in 169 cases, or a mortality of 28.4 per cent.

THE OPERATIVE TREATMENT OF HERNIA.

During the past year several valuable series of cases have been reported, giving additional proof of the value of the operation for the radical cure of hernia. Barker² reports 200 consecutive operations which he has performed for this condition. He believes that operative interference is called for in the young after infancy and in those who are debarred from any particular calling by reason of the hernia. As regards the mortality of the operation for radical cure, there were three deaths in the 200 operations. One case died of ether poisoning; the anaesthesia was begun with ether, for which chloroform was substituted as the patient took ether badly, and finally this was changed again to ether. The operation lasted fifty minutes, during which time the patient showed considerable cyanosis and difficulty in breathing. While the wound was being dressed the breathing became heavier, and finally stopped altogether; death followed in spite of all attempts at artificial respiration. The patient was thirty-three years of age, apparently healthy, and there was nothing unusually complicated in the operation, which was performed according to Bassini's method. In both of the fatal cases the hernia was a large irreducible inguinal rupture, containing the sigmoid flexure, and in one, in addition to the latter, there were present the bladder, omentum, and large intestine. The first of these was a man sixty-one years old, and as the bowel could not be reduced the wound was closed at once. Death occurred several days later, having been preceded by symptoms of intestinal obstruction, although no cause could be found at the post-mortem examination. The second patient was a very large, gross-looking man, fifty-one years of age, with an enormous left inguinal hernia, which had been irreducible for two years. The sac and other coverings were found to be greatly thickened and the contents were reduced with extreme difficulty; the opening was closed by Bassini's method. The patient died on the fourth day as a result of extensive suppuration followed by septic peritonitis.

These cases of Barker furnish strong evidence of the dangers that attend operations for radical cure in large irreducible herniæ. I have always contended that operations are contra-indicated in this class of cases, and as our statistics of operation become more complete, the high mortality attending operations in these cases supports this view. With the excep-

¹ Berl. klin. Wochenschrift, 1896, xxxiii, 443.

² Surgeon to the University College Hospital, British Medical Journal, September 10, 1898.

tion of the three cases mentioned, Barker states that in no other instance was the patient's condition at any time critical. In only twenty-six cases did suppuration of any kind occur, and in many of these it was limited to a slight stitch-hole abscess. He states that in a considerable number of cases where discharge was present the cause was plainly attributable to wetting of the dressing with urine. When this occurs he believes the dressing should be immediately removed.

Personal experience persuades me that the influence of the urine in preventing primary union after operation for hernia has been very much over-estimated. But a few years ago a distinguished surgeon of New York proposed perineal section, draining the bladder through the perineum temporarily, in order to avoid contamination of the dressing during the wound-healing in operations for hernia in children.

I have operated upon a considerable number of children who had incontinence of urine, and, although the dressing was completely saturated, primary union invariably occurred.

Barker very correctly lays stress upon the importance of carefully regulating the tension of the sutures. In all of his cases silk was used for the buried sutures, and it is interesting to note that in 21 cases out of the 200 some of the sutures came away either in the hospital or at some subsequent period. Extrusion of non-absorbable buried sutures, while undoubtedly favored by suppuration, may, as Barker correctly observes, be due to the absence of any suppuration during the wound-healing. In proof of this may be offered a series of cases observed at the Hospital for Ruptured and Crippled, and recently reported in the *Annals of Surgery*¹ by Dr. Bull and myself.

The ages of the patients operated upon by Barker ranged from three months to seventy years, 35 being under twenty years; 132 between twenty and sixty. There were 10 cases of femoral hernia, 4 umbilical, and 13 ventral; 79 were operated upon by Barker's own method, 57 by Bassini's, 7 by Kocher's, and 2 by Macewen's. In nine cases of ventral and umbilical hernia the deep-buried silver-wire sutures, as advocated by Schede, of Hamburg, were used. In one case in which suppuration occurred it was found necessary to remove the silver wire; in one other case, the patient being a neurotic woman who imagined the silver stitches caused discomfort, they were removed. In all cases, with the exception of ventral and umbilical hernia, hard-twisted Chinese silk boiled in a solution of 1:20 carbolic, was used. Although these silk sutures came out or had to be removed in 21 out of 200 cases, Barker regards this as a very small percentage, and seems to attach very little importance to what I believe to be serious disadvantages inherent in non-

¹ November 18, 1898.

absorbable sutures. A careful study of the cases which I have observed, shows that in a large proportion of them the formation of slowly healing sinuses and long-continued suppuration so weaken the canal that in the great majority of cases recurrence of the hernia results. In addition to this important fact, the minor disadvantages connected with a condition requiring frequent medical attention, to say nothing of the annoyance and personal discomfort, in many cases sufficient to incapacitate the individual for performing his regular occupation, should be considered. These disadvantages would naturally be allowed little weight if the operations in which non-absorbable sutures were employed showed better results than those in which the absorbable sutures were used. Such, however, is not the case. Barker's paper contains few data bearing upon subsequent results of his operations, as the cases were not systematically traced.

As regards choice of method, he believes Bassini's operation, when carefully carried out, to be the best of any yet devised.

Hernia of Cæcum and Appendix. Catalini,¹ of Padua, Italy, reports two rare cases of hernia, the first being a left femoral hernia in which the sac contained both cæcum and appendix. The hernia was of enormous size, reaching down to the knees, and contained at the time of operation the descending colon, cæcum, and vermiform appendix, the transverse colon, and about eighteen inches of small intestine. The operation was performed on account of a strangulation; the patient died, however, eight hours afterward. Catalini, quoting the statistics of Klein, Brieger, Baiardi, and Brianson, states that of a total of ninety-eight cases of hernia of the cæcum and appendix only two cases of left-sided hernia were noted. Catalini states correctly, we believe, that hernia of the cæcum and appendix in general is much more frequent than has been hitherto thought, owing to the fact that many observations have failed to be reported. He says that within five years of surgical practice in Prof. Tricomi's surgical clinic he has himself operated upon 421 herniæ, 295 inguinal and 126 crural. The appendix was found four times, either alone or with the cæcum. He states that, according to Hildebrand, hernia of the cæcum should occur on the left side in 16 per cent. of the cases. This percentage he believes to be too high, and would estimate it at not more than 1 per cent. A distinction but little recognized should, I think, be made between cæcal hernia in adults and in children. While the condition is apparently rare in adults, it is comparatively frequent in children. Out of 400 cases in children between the ages of four and fourteen years, operated upon at the Hospital for Ruptured and Crippled, of New York, between 1891 and 1898, in nineteen cases the

¹ *Annals of Surgery*, December, 1898.

cæcum and appendix alone or together were found in the sac. In nine cases the appendix was present; in eight it was adherent to the sac by more or less extensive attachments. In one of these cases, a boy of seven years, a long adherent appendix was found in the sac of a left inguinal hernia, making four cases thus far reported of left-sided appendix hernia. In one other case, a boy aged two years, the cæcum was found in a right femoral hernia.

HERNIA OF THE VERMIFORM APPENDIX. M. Jaja¹ reports 27 cases of hernia of the vermiform appendix which occurred in 1586 radical operations performed by Prof. Colzi at the surgical clinic of Florence; 21 of the 27 cases were without complication; 6 were strangulated. Jaja advises resection of the appendix in every case in which it is found in the hernial sac, and states that the excision of the sac does not increase the gravity of the operation.

Lateral Hernia of the Small Intestine. Catalini describes his second case as one of inguinal hernia of the small intestine without a peritoneal sac. The patient was a female, aged thirty-nine years, who had a year previously first noticed, in the right inguinal region, a swelling which increased in size during bodily strain. A month before the appearance of the swelling an incision had been made in the same region on account of a purulent gathering. A knuckle of intestine was found to adhere directly to the inner surface of the abdominal wall, opposite the outer opening of the inguinal canal, without any intervening tissue. Lateral enterorrhaphy being impossible, on account of the adhesions entirely surrounding the knuckle of intestine, 8 cm. of the bowel were resected and the Murphy button employed. The patient made an excellent recovery. Catalini regards the case as one of lateral hernia of the small intestine, and reports it as a warning to other surgeons.

Ball's Method of Operation. Ball, Professor of Surgery in Dublin University, one of the pioneers for the radical cure of hernia, and the author of the well-known method of torsion of the sac, first used in 1884, has recently introduced what he believes to be an improvement on his former method. Since 1887 he has operated upon upward of 150 cases. His method as recently modified is as follows: An incision is made about one inch long over the neck of the rupture and carried down until the sac is opened. The finger is introduced to examine the contents of the sac. The sac having been dissected entirely out of the inguinal canal, is caught with the forceps and slowly twisted until it is fairly tight. The finger is then passed up into the subperitoneal tissue for at least an inch, and a large curved needle, threaded with a stout piece of silk, is passed beside the finger in the subperitoneal space,

¹ Thirteenth Congress of Italian Surgeons. *Revue de Chir.*, February, 1899.

and then directly forward through the muscular tissues to the skin of the abdominal wall. The other end of the same piece of silk is then passed by the needle in the same way, but on the other side of the twisted sac, and brought out through the abdominal wall at the same level and near the first end. By drawing the two ends of silk the twisted sac is pulled up into the subperitoneal tissue back of the muscular portion of the abdominal wall, where it is fixed by tying the silk over a lead plate.

Ball states that since 1893 he has operated upon seventy-four cases by this method. One case, only, proved fatal, and this was a double hernia of large size in a man of fifty-seven years. The patients were not systematically traced, and only a small number of relapses were known to have occurred. His objections to the operations of Bassini and Halsted are that they necessitate free division of the abdominal wall, which he believes undesirable.

These objections are purely theoretical, as shown by the results of Bassini's and Halsted's methods. Further reference to the advantages or disadvantages of preserving the sac will be found elsewhere.

Results of Operation at Kocher's Clinic. Lebensohn¹ gives a very extensive report of the results of operation for the radical cure of hernia at Kocher's clinic since 1893: 163 patients were operated upon for 197 herniæ. In 129 patients the hernia was single, in 30 double, while 2 had four herniæ each; 162 operations were for inguinal hernia, 17 for crural and 18 for umbilical, ventral, and epigastric hernia.

The age of the patients ranged between one and seventy-one years; 6 were under five, 20 under sixteen, 81 between sixteen and forty, 61 between the ages of forty and seventy-one years, two-thirds of the patients being between the ages of twenty and fifty years.

As to the duration of the hernia, it had existed from one to ten years in 78 cases; upward of ten years in 38 cases. In regard to the size, it is stated that in 77 cases the hernia was of small size, in 80 of medium size, and of large size in 14.

The method now preferably employed for external inguinal hernia at the clinic is as follows: After rendering the field of operation absolutely aseptic, an incision is made over the entire length of the inguinal canal and laterally, somewhat beyond the same. After thus laying bare the fascia of the oblique muscle of the abdomen and splitting the fascia infundibuliform, the sac is carefully loosened and isolated from the tissues of the cord. An opening is then made in the external oblique fascia exactly opposite the internal abdominal ring, and a bent dressing forceps is passed (under the protection of the finger) through the canal

¹ Deutsche Zeitschr. f. Chir., 1898, Band xlviii, Heft 5 and 6, p. 538.

in front of the cord and out at the anterior inguinal ring. The tip of the isolated sac is caught and energetically pulled back through the canal to the small opening in the external oblique fascia. The sac is then fastened laterally by three sutures upon the surface of the external oblique fascia over the lateral portion of Poupart's ligament; the largest portion is then cut off. By means of deep canal sutures the inguinal canal is then drawn together (narrowed), special care being taken that the suture nearest the proximal portion of the hernial sac be laid deep, the cord being protected by the fingers.

One of the principal advantages of this method, which Lebensohn considers superior to Bassini's, is that the inguinal canal is not opened, so that if suppuration should set in after operation the canal is not thereby widened, as would be the case if it had been opened.

Of 103 herniæ operated upon by this method of Kocher's, wound-healing was noted in 80 cases. Primary union occurred in 91.3 per cent., the average duration of healing being 10.7 days; 7 cases, or 8.7 per cent., healed by secondary union, the average duration of healing being 32.6 days.

Final results were noted in 88 herniæ. Adding to these the cases of Beresowsky, operated upon by the same method, we have 105 patients with 111 herniæ, with 4 recurrences, or 3.6 per cent. None of the cases which relapsed was operated upon by Kocher himself, but by assistants, and it may be assumed that the technique was not perfect. Twenty-three patients are free from relapse more than two years; 4 of these had double herniæ; 31 patients with 35 herniæ are free from relapse more than a year after operation; 25 patients, one of them having a double hernia, are free from six months to a year. In no instance was a truss worn after operation.

As to the mortality of the operation, not a single death is recorded in a series of 126 operations.

The method known as "suture of the canal" was employed in fourteen cases of internal inguinal hernia. Healing was noted in eleven cases, and with one exception primary union was obtained, the average period of healing being 12.7 days; in the one case which healed by secondary union it took 41 days. The final results in these cases were very unfavorable, only three of the seven that were traced being cured. In the other four, who had double herniæ, relapses occurred.

Of the fifteen patients with crural hernia, one had an additional external inguinal hernia; two had, outside of a double crural, a double external inguinal hernia.

In three of these cases Kocher's new method, the so-called "*Verlagerungsmethode*," was employed; in the others the "suture of the canal" method. The latter consists in an incision above the inner third

of Poupart's ligament, and isolation of the sac from the surrounding tissues and the femoral vein. The sac is then firmly pulled out, punctured with a needle as high up as possible and ligated to both sides. After removal of the sac the mouth of the same is closed with one or two deep button-sutures. The latter draw Poupart's ligament toward the pectineal fascia, thus creating a sort of prolongation of Gimbernat's ligament as far as the femoral vein. A further closure of the inguinal ring must not be attempted; it may cause thrombosis of the femoral vein.

As to the "*Verlagerungsmethode*" employed in three of the crural herniæ, the principal points are as follows: After isolating the hernial sac a small opening is made in the tense tissues of the external pillar of the inguinal ring, the bent forceps is drawn downward posteriorly to Poupart's ligament; the tip of the sac is caught and pulled through the external oblique fascia, and a suture is placed around the neck of the hernial sac and the place where it protruded, and drawn tight. The sac is removed and the mouth closed by deeply stitching Poupart's ligament, the pectineal fascia and Cooper's ligament. By two to three sutures Poupart's ligament is fixed to the pectineal fascia up to the femoral vein. Further than this the femoral ring should not be closed, as this would involve risk of a thrombosis. The remaining part of the sac is cut off.

Healing was noted in nine of these cases of crural hernia; eight healed by first intention, the average duration of healing being 9.1 days. Healing was interrupted in two cases, one taking 48 the other 42 days. One patient was dismissed with the wound not closed. Eleven cases were traced to final results, and all are definitely cured.

Of the series of eighteen patients with umbilical, ventral, and epigastric hernia, nine had umbilical, three ventral, and six epigastric herniæ.

The method of operating was as follows: The hernial sac was isolated as high up as possible, and a stitch put through the neck, which was then ligated; the mouth of the sac was closed by button-suture. This was followed by a continuous suture of the skin. Wound-healing was noted in nine cases, in all of which primary union ensued. As to the final results of the operation, fourteen cases were traced, and of these three had a recurrence.

From his observation of these cases Lebensohn draws the following conclusions with reference to indication for operation:

1. The radical operation for the cure of hernia does not involve any danger, and the chances of a definite cure are very great.
2. In irreducible herniæ, or those in which symptoms of incarceration are present, a radical operation is absolutely indicated.
3. Reducible herniæ, when they can be held back by a truss only in

such a way as to cause the patient inconvenience, should be subjected to radical operation.

4. Operation should be performed when the patient, tired of wearing a truss, wishes to be cured by radical interference.

5. The operation is contraindicated when the general health of the patient is poor; when diseases of vital organs are present, etc.

Fowler's Method for the Cure of Inguinal Hernia. George R. Fowler¹ describes a new method of radical cure which he designates as "Intraperitoneal Transplacement of the Spermatic Cord."

The purpose of the operation is to obliterate the internal ring. This is accomplished by dividing the transversalis fascia and peritoneum between the internal ring and the symphysis pubis, bringing the cord downward and out at the upper border of the pubes, and suturing all of the severed layers above it. The accompanying illustrations show very clearly the principal steps of the technique. (See Plates.)

The skin incision is slightly curved, at first following the pubic bone and then Poupart's ligament. The tissues are then cut until the aponeurosis is exposed. The anterior wall of the canal is now split up to the site of the internal ring. The cord and sac are first isolated together, the isolation commencing at the pubic bone where the cord is usually easily identified and separated. These structures are next separated from each other, each being traced to the internal ring and thoroughly isolated from all structures in the neighborhood.

The hernial sac is now opened, its contents reduced if reduction has not already occurred, and the sac cut away to the level of the muscular layer of the abdominal wall. Its incised edges are grasped by forceps to prevent these from slipping away. The cord being held out of the way, the place of crossing of the deep epigastric artery upon the transversalis fascia is sought and both the artery and vein isolated, ligated in two places and divided between the ligatures. The index-finger is now introduced into the peritoneal cavity through the neck of the sac, and the posterior wall of the canal, as well as the site of Hesselbach's triangle, lifted up upon the palmar surface of the finger. With the latter as a guide the entire intervening structures are divided with the scissors, the division including, from without inward, the transversalis fascia, the subperitoneal connective tissue, and the peritoneum.

The spermatic cord is now placed into the peritoneal cavity; the gap in the incised posterior wall of the inguinal canal is held apart by grasping the incised peritoneal edges with forceps. In those instances in which the internal ring is greatly enlarged in all directions and a large neck to the hernial sac exists, a slit may be made in the edge of the

¹ *Annals of Surgery*, December, 1897.

latter toward Poupart's ligament, in order to lead the cord easily to the peritoneal cavity. (See Plates.) The edges of the opening are now drawn forward so that a broad approximation of their serous surfaces is obtained. While held in this position through-and-through sutures are passed from side to side. By this manœuvre any existing relaxed state of this portion of the transversalis fascia is corrected.

The suture is first passed above the site of the internal ring, and includes the transversalis fascia, which is drawn downward and forward for that purpose. This serves to cover the point where the cord passes into the peritoneal cavity at the site of the internal ring, thereby obliterating the latter, the cord itself filling the small opening in the peritoneum. The position of the cord upon the peritoneal surface of the abdominal wall is such as to act as a "shunt," carrying any intestine in the neighborhood away from, rather than toward, the original weak point.

The suturing is continued until the lower angle of the gap in the posterior wall of the original inguinal canal is almost reached. This angle should be made low enough to compel the cord to curve slightly upward and forward as it leaves its place of exit from the peritoneal cavity at the newly formed external ring. The cord should rest easily in the angle, and the suturing stop short of constricting it therein.

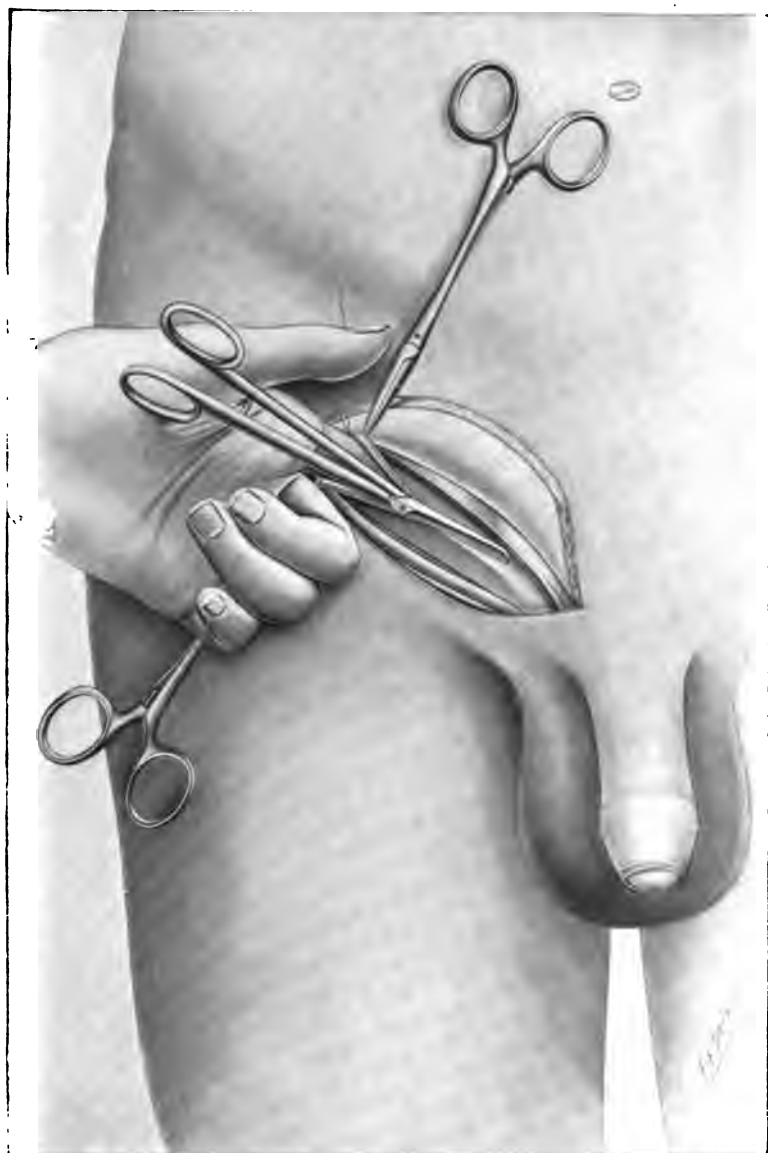
The inguinal canal, including the gap in the aponeurosis of the external oblique which represents the external ring, and the skin wound are now to be closed. In effecting this the choice of material lies between absorbable sutures, such as animal tendon, catgut, etc., and non-absorbable sutures.

Fowler states that the choice of sutures lies between absorbable buried sutures and non-absorbable *removable* sutures. He does not believe in using buried *non-absorbable* sutures, having been obliged to remove such sutures after periods varying from three months to three years after the original operation. He favors the use of kangaroo tendon. "The canal sutures include the conjoined tendon and aponeurosis of the external oblique upon the inner margin, and Poupart's ligament on the outer. The two lower sutures should include the outer edge of the pyramidalis, if this be present, and if not, the rectus muscle. The effect of this is to displace a portion of the muscular tissue to a situation which guards the point of exit of the spermatic cord. A continuous suture is now applied to secure more accurate coaptation of the margins of the aponeurosis of the external oblique, the turns of the suture passing in the spaces between the interrupted sutures.

The skin wound is closed by a subcuticular or other appropriate suture, and proper sterile dressings applied.

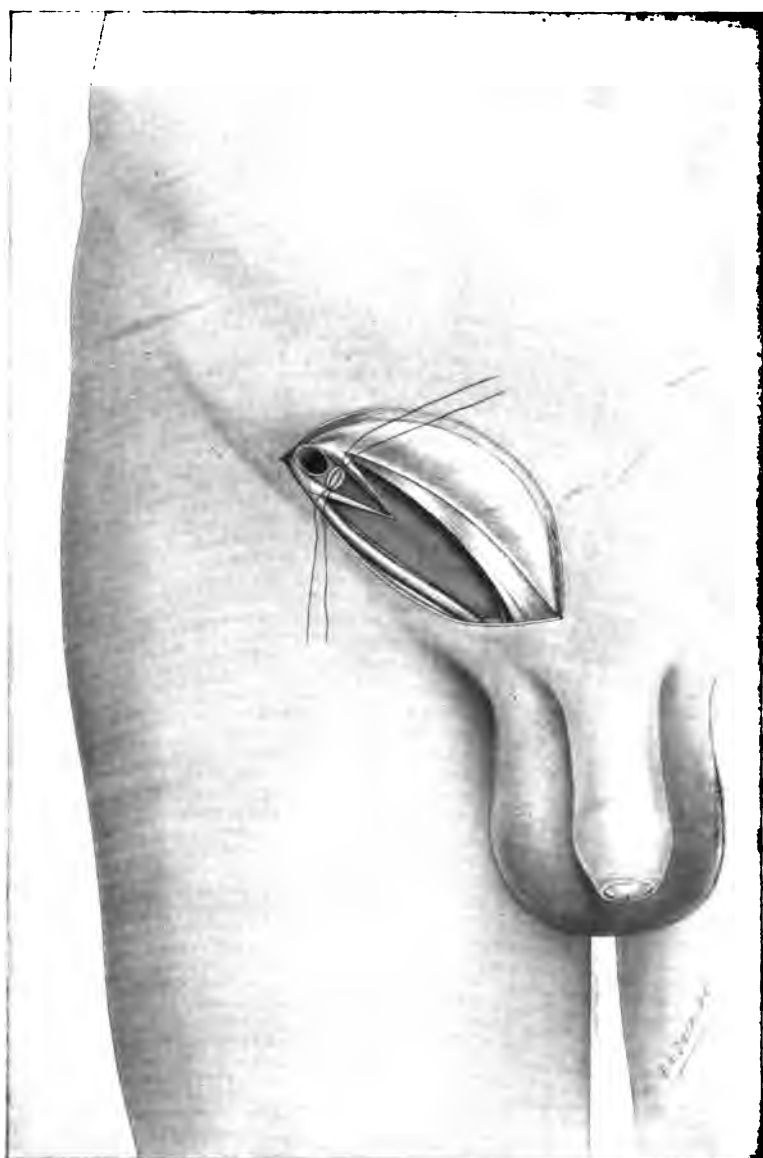
While I have had no personal experience with this method of Fow-

PLATE I.



Fowler's operation for inguinal hernia. (Transplacements of cord.)

PLATE II.



Ligature of deep epigastric artery and vein. Incision of transversalis fascia.

PLATE III.



Hernial canal opened, showing hernia sac and cord isolated.

ler's, I believe the principles upon which it is based are sound. If the operation is performed strictly according to the technique laid down by Fowler, and primary wound healing occurs, recurrence ought not to take place. While I am of the firm opinion that the great majority of herniæ in which any operation for radical cure is indicated can be successfully treated by Bassini's method, there are some cases in which Fowler's method would seem to offer advantages—*e. g.*, cases of hernia associated with a partially descended testis. In these cases Fowler's method would permit of elongation of the cord to the extent of an inch or more, and this would enable the surgeon to bring the testes into the scrotum in cases in which this would otherwise be impossible.¹

Champonniere's Method. Champonniere¹ reports the results obtained by his own method for the radical cure of hernia. The total number of cases is 650. Of these 556 were inguinal; 507 in males and 49 in females; 46 were femoral, 13 males and 33 females; 22 umbilical, all of which were in females; 14 epigastric, all males; 12 ventral. In the cases traced only 22 recurrences were found. The total number of deaths was 5, or $\frac{7}{100}$ of 1 per cent. Most of these deaths occurred in the earlier cases, and 265 consecutive operations were performed without a fatality. No truss was worn after operation. The recurrences were generally found in cases of hernia of the large intestine or in obese or aged subjects. Champonniere does not believe that his mortality of $\frac{7}{100}$ of 1 per cent. by any means represents the present risks of operation, inasmuch as with the knowledge now at our command several of the deaths in his service might have been avoided.

Lannelongue's Injection Method of Zinc Chloride. Champonniere expresses himself as very much opposed to this procedure. He believes that it is not only ineffectual in producing a radical cure of hernia, but that it is by no means free from danger. He states that the acknowledged accidents attending this method are infinitely greater than those observed in the operation for radical cure of hernia in skilled hands. The pain and discomfort following injections are far greater than those seen after the radical operation. Lannelongue and Demars,² in one of the most recent reports upon the method, advise giving an anæsthetic and using 1 to 4 or 5 c.cm. of a 10 per cent. solution of chloride of zinc. The needle is inserted through the external ring and is carried well into the inguinal canal. As the needle is drawn out the syringe is slowly emptied, bringing the fluid in contact with the canal. The patient is kept in bed for ten days, and is advised to wear a truss for some time following.

It seems to me that the description of the method is quite sufficient reason for condemning it. I thoroughly concur with Champonniere's

¹ Bull. de l'Académie de Méd., August 3, 1897.

² Centralblatt für Chirurgie, August 28, 1897.

opinion of the method, and now that it has been demonstrated that radical operations may be performed without pain and without confining the patient longer than ten to fourteen days in bed, with practically no mortality, I believe that Lannelongue's method, as well as all other injection methods, should find no support from the intelligent practitioner. The results obtained by the zinc chloride injections by no means support the claims of its advocates. Nimier¹ reports twelve cases with nine immediate successes and three failures. The cases were observed but a few months after operation, hence the final proportion of failures is not known.

Deaver's Modified Operation. John B. Deaver² describes what he terms "A Modified Operation for the Radical Cure of Inguinal Hernia." He states at the outset: "None of the operations thus far advocated and performed for the radical cure of hernia has impressed me very favorably with their undoubted permanency of cure." He goes on to say that while in the majority of the cases on whom he has operated the results have been satisfactory, he has seen recurrences from both Bassini's and Halsted's operation. The point where the recurrence first appears, he states, is at the upper end of the canal at the site of the internal ring. He believes that after both Bassini's and Halsted's operation, more frequently the former, there remains a hernial fossa, and it is to obliterate this supposed hernial fossa that he proposes a modification in technique, the same consisting in puckering up the hernial sac, "delivering it within the abdominal cavity after the manner of Macewen, and anchoring it at the site of the internal abdominal ring." He states that this can be done with a much greater degree of certainty and security with the inguinal canal laid open; and that his method is a modification of the open operations, combining the advantages of Macewen's method. The hernial sac, after being exposed by the division of the tissues constituting the anterior wall of the inguinal canal, is separated through its entirety and a small opening made in it. After separating the adhesions the sac is folded up and delivered within the abdominal cavity and anchored by means of a suture, made to traverse the abdominal wall, which is tied down upon the aponeurosis of the external oblique. The canal is closed by a modification of Bassini's and Halsted's operation. The cord is held to one side and the walls of the canal brought together with interrupted silver-wire sutures introduced by a Reverdin needle, commencing at the lower end of the wound and suturing upward. The aponeurosis, the anterior sheath of the rectus, the rectus, triangular ligaments of the abdominal walls, conjoined tendon, transversalis fascia and, finally, Poupart's ligament are trans-

¹ Congrès Français de Chir., 1897, p. 404.

² Annals of Surgery, April, 1898.

fixed with the needle and the suture placed ; the second suture traverses the aponeurosis, the conjoined tendon, transversalis fascia, and Poupart's ligament ; the third, the aponeurosis of the internal oblique, transversalis, transversalis fascia, and Poupart's ligament ; the fourth and fifth, the same as the third. Before these sutures are tied the edges of the divided aponeurosis are brought together by means of a continuous kangaroo-tendon suture, sufficient space being allowed at the upper part of the canal for the exit of the cord. The interrupted silver-wire sutures are now tied, the cord placed in contact with the aponeurosis, and the skin fascia is brought together by means of a subcuticular silver-wire suture or interrupted wormgut sutures. In other words, the modification consists simply in adding Macewen's method of dealing with the sac to Halsted's operation and the substitution of the ordinary method of suture for the mattress suture. Deaver's objection to the mattress suture is that it cuts the aponeurosis or the adjoining fascia lata near it. He states that from his experience with the modified operation he is of the opinion that it guards against recurrence better than either Halsted's or Bassini's operation. He fails to state, however, the extent of his experience with this method or the duration of the cures, and, therefore, the value of the method must at present be judged entirely upon its theoretical advantages or disadvantages. In the writer's opinion, the method offers no advantages over the Halsted method, and he believes it to be distinctly inferior to Bassini's. The recurrences which Deaver states he has observed to follow Halsted's and Bassini's operations were not, in my opinion, due so much to the presence of a hernial fossa from incomplete or imperfect closure of the neck of the sac as to the fact that the point where the cord emerges at the internal ring is admittedly weaker than the remaining portion of the canal after both the Halsted and the Bassini operation, and if a recurrence takes place at all it is natural that it should occur at the weakest place. After Halsted's operation there is nothing to prevent a hernia from recurring at the site of the cord except the skin and superficial fascia, and it was to overcome this weak place in the operation that Halsted originally advised removal of the major portion of the veins of the cord in order to lessen, as far as possible, the danger of recurrence at this point. Now that the experience of Halsted and more particularly that of other surgeons, has shown that there is serious danger of atrophy of the testicle if the veins be removed, a larger opening must be left for the cord than was originally intended, and, therefore, the dangers of recurrence at this point are increased.

Turning now to Bassini's operation, while it is true that the internal ring remains, as in Halsted's operation, the weakest part of the canal, this weak place is covered by the strong aponeurosis of the external oblique passing over the cord, and is not simply protected by the skin

alone, as in the Halsted operation. Herein lies, I believe, the distinct superiority of Bassini's operation over Halsted's. If a suture is placed just above the cord, preventing any further separation of the fibres of the internal oblique or enlargement at the site where the cord emerges—a slight addition to Bassini's original technique, which the writer has employed during the past seven years—the region of the internal ring is still further strengthened, and if primary union is secured recurrence ought not to take place. That this method will give practically perfect results is shown by those who have employed it extensively. In 500 cases operated upon by Bassini's method the writer has had but five relapses. A great effort has been made to follow these cases, and with but few exceptions they have been traced to final results. The objection to the use of silver wire and all non-absorbable sutures is dealt with at length elsewhere.

Other New Methods of Operation for Hernia. During the past year Dr. Joseph C. Bloodgood,¹ Associate Surgeon of Johns Hopkins Hospital, has introduced a new method, or, rather, a new step in Halsted's method, applicable to a rare variety of inguinal hernia. This method is designated as "the transplantation of the *rectus muscle* in certain cases of inguinal hernia in which the conjoined tendon is obliterated."² It is stated that the term "obliterated" is used because the extreme condition is more likely to be an acquired than a congenital one. The important point to be recognized at the operation is "that the conjoined tendon is either obliterated, very narrow, or very attenuated, and the lower angle of the inguinal canal (Hesselbach's triangle) has lost its strongest support—the conjoined tendon—and that something, the transplanted rectus muscle, must be substituted for this defect at the operation for hernia."

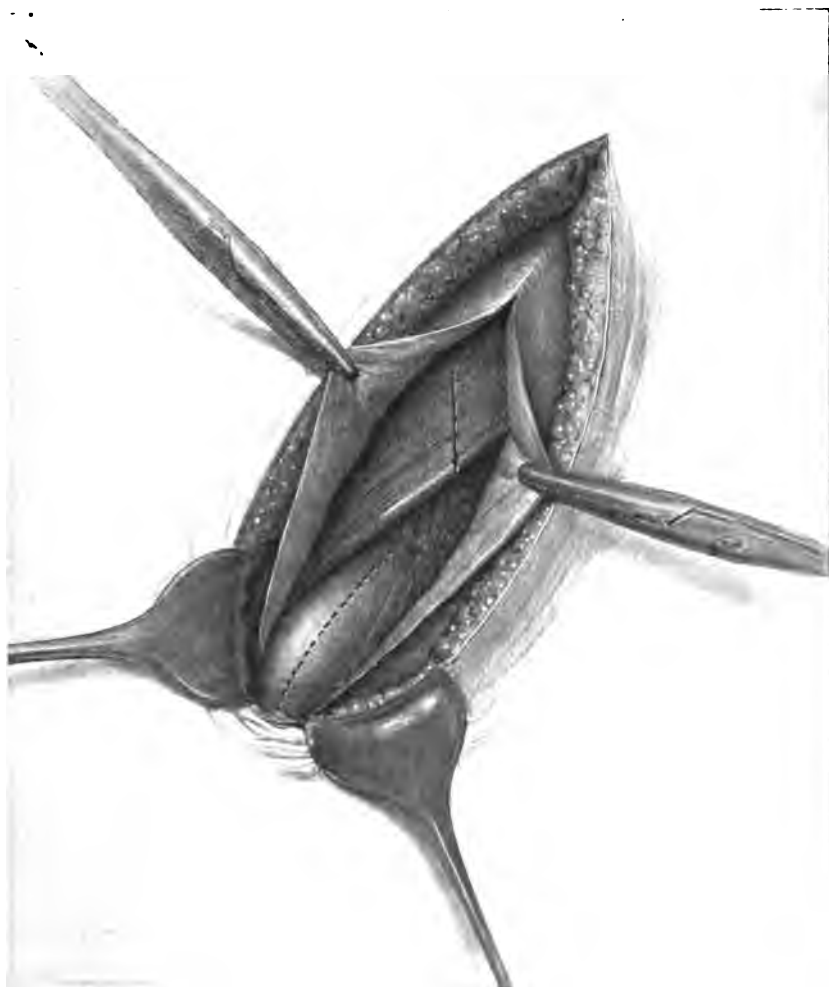
Bloodgood would divide all cases of inguinal hernia into two classes, the larger group including those cases in which the conjoined tendon is wide and firm, and a much smaller group including such cases in which the conjoined tendon is practically completely obliterated. In these cases it is stated that if one inserts the index finger, invaginating the scrotum after passing through the external ring, the finger does not meet any obstruction but can be introduced without difficulty into the abdominal cavity for some distance. In this position the finger feels the sheath

¹ Johns Hopkins Hospital Bulletin, May, 1898.

² Transplantation of the rectus muscle was advocated by Wölfler in 1892, Beiträge z. Chirurgie; and Slajmer, Archiv f. klin. Chirurgie, June, 1898, reported 150 cases of hernia operated upon by Wölfler's method. Bloodgood, however, had seen neither publication, and his work was quite independent. Slajmer does not cut the internal oblique, but does use the mattress sutures. He had 6 recurrences in 68 cases, traced from six months to five years. These results are much inferior to those obtained by Bassini's method.

of the rectus muscle ; by curving the finger downward and backward the posterior surface of the symphysis pubis can be easily palpated. Before operation the number of fingers which can be introduced is limited by the size of the external abdominal ring ; in some cases it is but

FIG. 35.

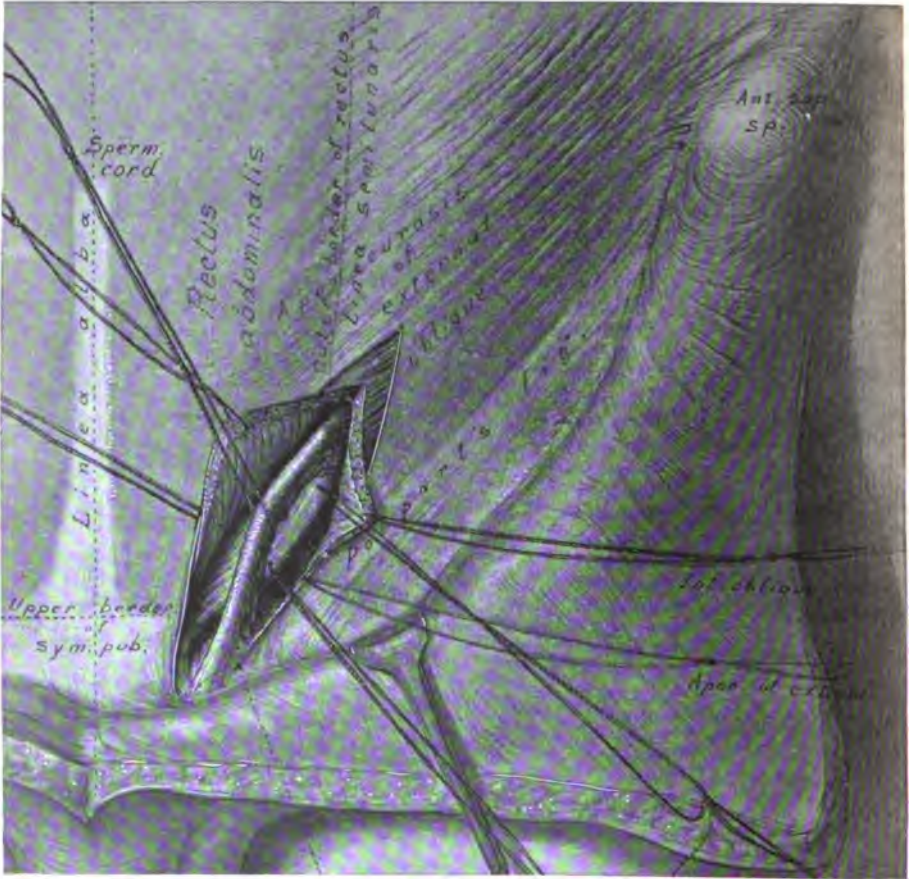


Bloodgood's method.

one finger, in others two or more. At the operation, after the division of the aponeurosis of the external oblique, one can easily introduce the entire hand into the abdominal cavity. In these cases the conjoint tendon is either thin and relaxed or completely obliterated, and the posterior wall of the inguinal canal is formed only by the thin and easily

stretched transversalis fascia or alveolar tissue. An analysis of the results following operation for hernia at the Johns Hopkins Hospital is introduced in order to show the necessity of some change in method in these cases in which the conjoined tendon is defective. In group A, in which the conjoined tendon was normal, there were 211 cases with seven recurrences, which all took place within one year ; in six cases the recur-

FIG. 36.

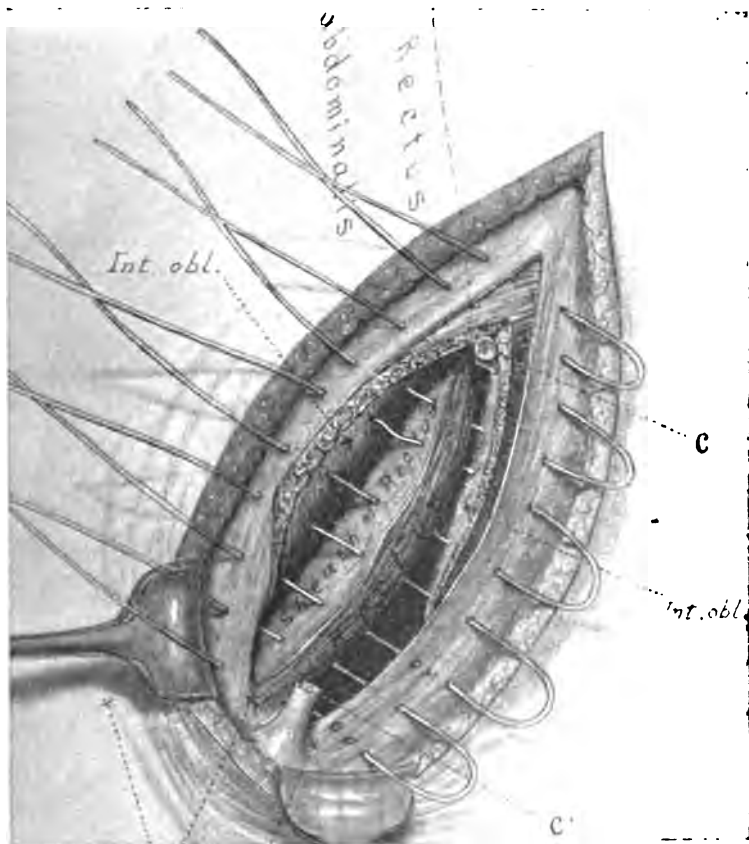


Bloodgood's method.

rence took place at the position of the transplanted cord. In the smaller group, B, in which the conjoined tendon was obliterated, there were ten cases with five recurrences, or 50 per cent. Each recurrence took place in the lower angle of the wound, within a few months or a year. In two cases the rupture descended to the scrotum. Impressed by this large proportion of recurrences in the few cases in which the conjoined

tendon was obliterated, Bloodgood devised and performed in eight cases a plastic operation upon the rectus muscle, bringing the muscle down and suturing it with the available tissues to Poupart's ligament and to the aponeurosis of the external oblique, from the arch of the pubis to the position of the transplanted cord. The procedure is said to be a very simple one, and inclusion of the transplanted rectus in this portion of the

FIG. 37.



Bloodgood's method of transplanting the rectus muscle.

wound must add strength. In proof of the theory that utilization of muscular tissue is of advantage, he cites the numerous herniæ following laparotomy in which the incision was made in the linea alba, whereas in cases in which the incision was made through the rectus muscle he states that after careful observation of all the laparotomies performed at the Johns Hopkins Hospital for a period of over eight years there has been but one hernia in a laparotomy wound which has healed by primary

union throughout, and in which muscle as well as fascia has been approximated. He adds that so impressed have they been with the importance of including muscle in sutures for laparotomy wounds that median laparotomy has been abandoned, and the incision is now invariably made through the inner border of the rectus muscle rather than through the linea alba, and through the outer border rather than through the linea semilunaris. He still further adds that Halsted in his original conception of his operation for inguinal hernia divided the internal oblique muscle with this object in view.

This method of Bloodgood's, it seems to me, offers a satisfactory means of closing the canal in certain very rare cases. In a personal experience of upward of 500 cases of inguinal hernia, operated upon by Bassini's method, I have never seen a case in which a satisfactory closure could not be made. In only two cases was there any difficulty encountered, and both of these were direct herniæ. But three of the 500 cases were of the direct variety. I do not believe Bloodgood's method as indicated in oblique inguinal hernia is necessary.

The method of free division of the internal oblique muscle as practised in the Halsted operation has nothing, I believe, to recommend it. I am willing to grant that union of divided muscle should be firmer than union of fascia, but at the same time undivided muscle ought to be better than either. In Bassini's method, as practised by myself, great care is always taken not to divide a single fibre of the internal oblique. By slight separation or stretching apart of the fibres of the muscle the sac may be excised beyond the neck, and the cord can easily be transplanted on a level with, or slightly above, the internal ring. That this is sufficiently high, the results of the operation prove beyond a doubt. The various steps of the method advocated by Bloodgood are most clearly shown by a series of beautiful illustrations accompanying the article.

A slight study of these illustrations and a comparison of them with illustrations of Bassini's method will, I think, convince one that the rectus muscle can be much more easily and satisfactorily sutured to Poupart's ligament, if one employs Bassini's method of suturing the muscle and aponeurosis in separate layers, rather than by including both layers in a single row of mattress sutures. Transplantation of the rectus muscle must be regarded as a part of Bassini's original technique. Bassini, in his original description of his method,¹ advocated placing the first or deep row of sutures far enough to the inner side to include the edge of the rectus muscle in at least two of the sutures, and in those cases in which the conjoined tendon is partially obliterated the edge of the

¹ Archiv f. klin. Chirurg., 1890, B. 39.

rectus would be naturally brought over to Poupart's ligament, especially in the lower portion.

The most recent results at the Johns Hopkins Hospital have been very kindly furnished me by Dr. Bloodgood from the advance sheets of an elaborate report soon to be published: Cases traced from six months to nine and one-half years, 261, with 17 relapses, or 6.5 per cent.; of these 230 healed by primary union, with 10 relapses, 4.3 per cent, and 31 suppurated, of which 7, or 22 per cent., relapsed. Of the series of cases in which Halsted's operation was performed, 195 cases, 11, or 5.6 per cent., relapsed; of these, 175 cases, or 90 per cent., healed by primary union and showed 6 relapses, or 3.3 per cent. Of 20 cases which suppurated, 5, or 25 per cent., relapsed. In 109 cases of Halsted's typical operation in which the veins were excised (100 healing by primary union, 9 with suppuration) there was no relapse. (The number of times atrophy of the testes occurred in this group is not stated.) In 30 cases operated upon by Bloodgood's modification of Halsted's method, in which the rectus muscle is sutured to Poupart's ligament, no case of relapse has been noted. These cases are, however, comparatively recent.

In 86 cases in which Halsted's operation was performed, with the exception that the veins were not excised, 8 cases, or 9 per cent., recurred; 56 of these cases were observed one to nine years, and 30 six months to one year. Of 62 cases forming a special group, the cord was not transplanted in 14; the cord was excised in 13; castration was performed in 22, and 23 were inguinal herniæ in the female. Of these 1 (in a female) relapsed. Six cases were operated on by McBurney's method, with 3 recurrences, 50 per cent. In 4 cases the testis was replaced in the abdominal cavity with 2 relapses, 50 per cent.

Bloodgood's conclusions as to the best operation for inguinal hernia are that Halsted's operation, with excision of the veins, will give perfect results if primary union occurs, except in these cases in which the conjoined tendon is obliterated, and in those cases the same perfect result may be obtained if the *transplantation of the rectus* muscle be added to the Halsted operation.

He admits that there is danger of atrophy of the testes after excision of the veins, and hence the ideal operation is not always advisable. He would not excise the veins (1) in cases in which the cord has been subjected to traumatism during the dissection of the sac. In such cases he would divide the cord into two sections and transplant each separately. (2) In children excision of the veins he would consider unnecessary, and in the female he believes it makes little difference whether the round ligament be transplanted or not.

The number of cases in which atrophy of the testes occurred is not

noted, but it was only observed when epididymitis followed the operation. Bloodgood believes that the probabilities of epididymitis are very much less when the veins are excised without disturbing the vas and its immediate vessels, and for this reason he would advise that "when the veins are excised the remainder of the cord, a very small affair, be left undisturbed," and he goes on to say that he believes "that the cord reduced to such diminutive size will be as little likely to be the cause of a recurrence in the lower angle of the wound as in the upper angle where it is transplanted."

It is stated that in the last 200 operations closed with buried sutures of "silver wire and glow-worm" only ten suppurated, and no late sinuses or extrusion of suture have been noted.

These results simply show that in certain cases under the most favorable conditions non-absorbable sutures may be used without causing trouble for a certain length of time. To be convincing, the history of these cases should be followed for a much longer period, as I have observed buried sutures, in a hernia wound that healed by perfect primary union, in a sinus three years and eight months afterward.

The Operative Treatment of Hernia in Infants. Froelich,¹ of Nancy, advocates extending the operative treatment of hernia to younger children than is, in the opinion of most surgeons, deemed necessary or wise. He has operated upon 82 cases under two years, with 4 per cent. mortality and 6 per cent. of relapses. He states that in children under two years of age there is a strong probability of cure by mechanical treatment, but after the age of two years cure is exceptional.

I am by no means in accord with this opinion, and as an experience of nearly ten years at the Hospital for Ruptured and Crippled has convinced me that a very large number of cases over two years of age are cured by trusses, I agree with Macready, that the cases in which the rupture cannot be successfully kept reduced by means of a properly fitting truss in infants and very young children, for example under four years of age, are very rare exceptions, far too rare to warrant us in advising operation on infants. As to the method of operation employed by Froelich, he advises suture of the neck of the sac without opening or excising the sac.

This method I consider very defective. Careful dissection and excision of the sac adds practically little or nothing to the risk of the operation or the time consumed in its performance, but it adds, I believe, very much to the chances of a permanent cure. In several cases operated upon at the Hospital for Ruptured and Crippled, prior to 1890, the sac was not removed, and in these cases recurrence almost invariably

¹ Congrès Français de Chir., 1897, p. 409.

followed. Broca¹ expresses himself in harmony with most of the views of Froelich, and states that while he was at first inclined to operate only upon children over three or four years of age, he has found the dangers of the operation so slight, and the results so good, that he now operates upon those very much younger. He has operated on 107 cases under two years of age, with two deaths; one death occurred in a child four months old, and was associated with marked diarrhœa. The second death occurred in an infant three months old, and was due to broncho-pneumonia.

Personally, I believe that the operative treatment is indicated in very few cases under the age of four years, and this opinion is based upon the following grounds:

1. Not until this age has been reached can one be sure that the rupture may not be cured by mechanical means.
2. The danger attending operation in infants is, I believe, considerably greater than the risks of a possible strangulation, which is rare under the age of two years.

Results of Operation in Children at the Hospital for Ruptured and Crippled. The results of operative treatment of hernia at the Hospital for Ruptured and Crippled has recently been reported by Dr. Bull and the writer in the *Annals of Surgery*, November, 1898.

During the years September, 1890, to 1897 inclusive, there were treated at the Hospital for Ruptured and Crippled of New York, 34,271 cases. Of these 28,892 were inguinal—male 24,810, female 4082; 1927 were femoral—male 558, female 1369; 2795 were umbilical—male 1078, female 1717; 658 were ventral—male 229, female 429.

In proof of the very great advances in the operative treatment of hernia since 1890, the results of nineteen cases of hernia in children operated upon at the hospital during 1889 and 1890 by the older methods of Socin and Risel were cited. Of these cases 50 per cent. relapsed during the first year. This hardly bears out the statement of some surgeons² that the method of operation is of little importance when operating upon children, nearly all methods being attended with good results. From December 12, 1891, to May 1, 1899, 480 operations were performed at the Hospital for Ruptured and Crippled for the radical cure of inguinal and femoral hernia in children under fourteen years of age, 422 being male and 38 female; 16 were femoral, 3 ventral, and 1 lumbar.

METHODS AND RESULTS OF OPERATION. Bassini's method, with kangaroo tendon, was performed in 342 cases; with silk sutures in one case. Slitting up the aponeurosis of the external oblique with high

¹ Congrès Français de Chir., 1897, p. 409.

² Gould's Year-Book of Medicine and Surgery, 1899.

ligation of the sac, closure of the canal in three layers with kangaroo tendon, without transplanting the cord, was performed in 34 cases. This is practically the method described by Stinson¹, of San Francisco, in 1896, but it had been performed by Dr. Bull and the writer four years prior at the Hospital for Ruptured and Crippled. In the writer's² paper on "The Operative Treatment of Hernia, with a Report of 200 Cases," read before the New York Surgical Society, January 23, 1895, it was stated: "Whether the transplanation of the cord is to be regarded as essential to the highest degree of success in hernia operations, it is hardly possible to state positively. It may be that high ligation of the sac, the perfect closure of the canal made possible by the splitting up of the aponeurosis, has quite as much to do with the good results as transplanting the cord. Of my own cases operated upon by this method without transplanting the cord, but using the same sutures (kangaroo tendon and chromicized catgut), none has relapsed, and some have gone more than three years; one was a very large double hernia, which was operated upon in April, 1892. The boy is perfectly sound at present, nearly three years later; another very large strangulated sigmoid hernia is well three and one-quarter years after operation."

Since 1892 Dr. Bull and myself have operated upon 34 cases by this method at the Hospital for Ruptured and Crippled, and upon 5 cases by the Socin and Czerny method; 14 cases for femoral hernia.

Of the 400 cases in children reported³ there was primary union in 373; slight suppuration in 15; considerable in 9. There were 3 deaths. Three relapses from Bassini's method, 3 from methods in which the cord was not transplanted.

Much time and effort was spent in tracing the cases to final results, and all but twenty-three were traced. Of the 400 cases, 142 were well over two years; 94 from one to two years; 12 well over five years; 25 from four to five years; 28 from three to four years; 80 from two to three years; 236 were well beyond one year. Of the femoral herniæ four were well over two years. Of the cases not traced, 13 were operated upon by Bassini's method; in 5 the cord was not transplanted; 2 were umbilical, and 3 femoral herniæ. Including adults, the writer has operated upon 600 cases of hernia, with 1 death due to pneumonia. The results, as traced to the present time, show that 338 cases were free from recurrences from one to seven and a half years after operation; 14 of them were well beyond six years; 18, from five to six years; 31, from four to five years; 62, from three to four years; 107, from two to three years; 135, from one to two years. Of 514 cases operated upon by Bassini's method with kangaroo tendon for buried sutures,

¹ Medical Record, 1896.

² Annals of Surgery, April, 1895.

³ Loc. cit.

there have been but 5 relapses. In 40 cases of femoral hernia there has been 1 relapse.

SUTURE MATERIAL. Silk was used in two cases, with the result of bad suppuration in one case with extrusion of the sutures; in the other the wound apparently healed by primary union, but a short time afterward a sinus developed, and the sutures came out. Relapse occurred in both cases within four months. In four cases chromicized catgut was used, and in one simple catgut; in the remaining cases chromicized kangaroo tendon was employed.

The writer has always been strongly opposed to the use of non-absorbable sutures in operations for the radical cure of hernia. His objections to non-absorbable buried sutures, including silk, silkworm-gut, and silver wire, are not theoretical, but are based upon personal observations in twenty-seven patients, whose histories are given in the paper just referred to. In every one of these cases a sinus or sinuses developed at varying periods after the healing of the wound—in some instances a few weeks or months, and in one case three years and eight months after the operation. In this case the suture material was silkworm-gut and the wound healed by perfect primary union; six months later a sinus developed, and one or two silkworm sutures were taken out at the sinus, which then closed. The patient remained well for two and a half years, when a second sinus formed and more sutures came out. The sinus again healed and there was no further trouble until three years and eight months from the time of operation, when a sinus again developed, and another silkworm-gut suture was removed.

These objections are very serious, inasmuch as the healing of the sinuses often required many months and the prolonged suppuration so weakened the canal that in most cases relapse followed. Silk, silkworm-gut, and silver wire are all represented in these twenty-seven cases. I do not deny that in the great majority of cases sterile, non-absorbable sutures will cause no trouble; but that they do cause trouble, and serious trouble, in a certain proportion of cases, has been demonstrated. Had we no other form of suture free from the disadvantages mentioned, we should naturally be obliged to continue their use. However, in chromicized kangaroo tendon, or even in chromicized catgut, we have sutures that will remain unabsorbed sufficiently long to permit of firm union of the tissues, and which, after this union has been accomplished, will become absorbed, never remaining long enough to give rise to the troublesome sinuses mentioned. These sutures have been used by the writer in upward of 550 cases of inguinal hernia and 40 cases of femoral hernia, and the immediate and final results are superior to any that have been obtained in similar operations in which non-absorbable sutures were used. Bassini, in his original paper published in the

Archiv für Klinische Chirurgie, 1890, states that silk was used for the buried sutures, but I have been recently told that Bassini discarded silk in 1892, since which time he has used only chromicized catgut.

The subject of sutures is dwelt upon at some length for the reason that many of the leading operators and teachers in surgery are at present advocating the use of silver wire.

In closing the skin incision I prefer interrupted sutures of fine catgut. These sutures are entirely absorbed at the time of the first dressing, and I believe that the chances of secondary infection of the wound are less than when a suture is used that has to be removed. The catgut and kangaroo tendon that I have used during the past seven years have been prepared by Van Horn & Co., of New York City, during the earlier years by the method of boiling in absolute alcohol under pressure, but more recently by the Cumol method proposed by Dr. Clark, of the Johns Hopkins Hospital.

I believe the dressing of the wound of very great importance. For this my personal preference is pads of iodoform and moist bichloride gauze, 1:5000, held in place by rubber plaster. Over this cotton and a firm spica bandage are applied, and in children there should be the further addition of a plaster-of-Paris spica extending from the knee to the chest. This insures perfect rest to the wound and materially aids in securing primary union.

When Bassini's and Halsted's operations were originally proposed the theoretical objection of possible atrophy of the testicle prevented many from adopting these methods. Further experience has shown that while this result has occasionally followed Halsted's operation, it is practically unknown in Bassini's. Atrophy of the testicle has never occurred in the writer's cases, nor has he seen it in cases of other surgeons employing this method.

O'Connor, of Buenos Ayres, has reported atrophy of the testes in 20 per cent. of 129 cases operated upon by Halsted's method.

Inguinal Hernia in the Female. The operative treatment of inguinal hernia in the female has, up to the present time, received but little attention. Champonniere was the first to urge operation in these cases. His method was to excise the round ligament with the sac but I consider this entirely unnecessary and not without objections. The method we have employed has been practically Bassini's method for the male, with the single step of transplanting the cord omitted. The round ligament can, in all cases, be freed from the sac. When this has been done the sac is dissected well beyond the internal ring, is then transfixed, tied, or sutured with catgut and excised. The round ligament is then allowed to drop back into its original place, and the tissues are sutured over it close down to the symphysis pubis. In the deep layers the internal

oblique and transversalis are sutured to Poupart's ligament by interrupted sutures of kangaroo tendon. Then the aponeurosis, which has been freely opened as in Bassini's method, is carefully sutured by a continuous suture of tendon. Champonniere has operated on forty-nine cases of inguinal hernia in the female. Halsted has operated upon twenty-seven cases. Howard Kelly¹ treats the round ligament exactly as Halsted does the cord, and completes the operation according to Halsted's method. Dr. Bull and the writer have reported 100 cases of inguinal hernia in the female, 52 adults and 48 children, operated on by this method. Of the adults, 23 were well upward of two years; 15 from one to two years. Of the children, 17 were well for two years. Of the total number, 40 were well over two years; 60 over one year after operation. Not a single case of relapse has thus far been observed. These results would seem to show that no advantage is to be had from transplanting the round ligament, and there is certainly no good reason for cutting up the internal oblique muscle.

Femoral Hernia. It is not generally recognized, especially among physicians, that the results of femoral hernia are so nearly perfect. Bassini² published a series of 54 cases operated upon by his own method, of which 41 were traced from one to nine years without a single relapse. There was no mortality. Dr. Bull and the writer have operated upon 100 cases of femoral hernia. Of this number, 16 were well from two to six years. In non-strangulated cases there were but three relapses. While femoral hernia is very rare under the age of puberty, we have operated upon twenty such cases.

A great variety of methods has been proposed for the radical cure of femoral hernia; many of these are very complex and difficult. In several of these methods it has been proposed to make an osteoplastic flap in the pubic bone to aid closure of the femoral opening. In another method, called the "inguinal operation for femoral hernia," the incision is made as for inguinal hernia, and an attempt made to close the femoral opening from within the pelvis. These methods appear to be open to serious objections. Osteoplastic methods, I think, increase the risk of the operation without any material increase in the chances of ultimate cure; in fact, I believe them to be much inferior to the simpler methods. The objections to the inguinal method are that in case of strangulation the contents of the sac, often infected with pathogenic germs, at the time of operation are emptied into the peritoneal cavity. Again, if the bowel is in such a condition that it is necessary to form an artificial anus, this can be done with greater ease and safety in the femoral than in the inguinal region. In those cases in which there is neither bowel

¹ Operative Gynecology, vol. ii. p. 481.

² Archiv für Klin. Chirurgie.

nor omentum in the sac—and this forms by far the larger class of cases in which operation for the radical cure is indicated—it is impossible to separate and remove the sac from the inguinal region without making a second incision in the femoral region. The operation does not commend itself to the writer in any class of cases since his experience in femoral hernia leads him to believe that all cases may be satisfactorily treated by one of the two following methods: Bassini's method, which consists in an incision about one-half inch below and parallel to Poupart's ligament, careful dissection of the sac and freeing it the entire depth of the femoral canal, tying it off or suturing it, incising it on a level with, or beyond its neck, and closing the femoral canal by two rows of buried sutures. This operation, the writer has employed in twelve cases, with one relapse which was undoubtedly due to suppuration. The other method which he would advocate is the one which may be designated as the *method of purse-string suture*. The sac is treated in the way just described, then a circular suture of kangaroo tendon is introduced first through Poupart's ligament, the outer part of which forms the roof of the crural canal, downward through the pectineal fascia and muscle forming the floor of the canal, outward, picking up the fascia lata overlying the femoral vessels, and lastly, upward through Poupart's ligament, coming out about one-quarter to three-eighths of an inch from the point of entrance. When this suture is tied it brings the floor of the canal in contact with the roof and completely closes the opening. It is very important, before applying this ligature, that the sac be thoroughly freed and that the stump be pushed back well into the abdominal cavity. I have employed this method in twenty-eight cases without a single relapse and ten of these cases have been traced from two to seven years. The only relapse in the forty cases treated by these methods was the one in which suppuration occurred. Since Bassini's method has given no better results and is slightly more complicated than the purse-string method, I believe the latter to be preferable, at least for femoral hernia in children and in the great majority of femoral hernia in adults. If the opening is very large—*e. g.*, would admit two fingers, Bassini's method would be the operation of choice.

Umbilical and Ventral Hernia. Attempts to cure umbilical and ventral hernia have thus far been far from encouraging. In thirty-four cases of umbilical and ventral hernia operated upon by Dr. Bull and myself there were twelve relapses in twenty-one cases traced. Of this number nine relapsed during the first year. In explanation of the large percentage of relapse in umbilical herniæ, it should be stated that the subjects were in most cases very unfavorable for radical cure. They were stout women past middle age, with a very thick layer of fat and a correspondingly thin layer of muscular tissue, and operations were per-

formed in most cases to relieve a condition which was the source of much pain and disability, namely, a large mass of irreducible omentum which had already become the seat of chronic inflammation. While relapses occurred in the majority of cases, the condition was generally improved over that prior to operation.

Epigastric Hernia and Hernia Following Appendicitis. The results following operation for epigastric hernia have been very satisfactory. The same is true of hernia following appendicitis. The method employed by the writer in hernia following appendicitis has been: Free excision of all the cicatricial tissue, careful dissection and exposure of the internal and external oblique muscular planes, with suture in separate layers of kangaroo tendon. One patient with a hernia the size of a coconut, following operation for acute appendicitis, is now well two and one-half years since operation for the hernia. Two other similar cases are still without recurrence. I have tabulated sixty-one cases of ventral hernia following appendicitis. In most of these cases the operation was performed for an acute attack, and the incisions were made upward of four inches in length. In many of these cases the hernia was the source of great disability, the tumors ranging in size between that of an egg and a child's head.

As regards the treatment of these cases, I believe much depends upon the age of the patient as well as upon the character of the abdominal wall. As a rule, these patients are young adults with good abdominal muscles and little accumulation of fat, the contrary of what usually obtains in umbilical hernia in operation, which so often contraindicates.

With herniæ sufficiently large to cause marked discomfort or disability, in view of the successes so far obtained in the cases personally operated upon, I would strongly recommend operation.

The same advice holds good in regard to ventral hernia following laparotomy, of which 340 cases have been observed at the Hospital for Ruptured and Crippled during the past eight years.

Relapses. For the purpose of ascertaining as nearly as possible the period when relapse is most likely to occur, as well as the time when a person who has submitted to operation may, with reasonable certainty, consider himself as having been cured, we have made a study of 361 cases of relapse following various operations for inguinal and femoral hernia which have been observed during the past ten years at the Hospital for Ruptured and Crippled. This analysis brings out the very important fact that relapse occurred in the great majority of cases within a few months after operation: In 64.5 per cent. during the first six months; 80 per cent. during the first year, and in only 20 per cent. after the first year. Between one and two years after operation 8.89 per cent. relapsed. From this fact we may conclude that in cases

remaining well beyond one year the chances of recurrence are greatly diminished. Among the few cases which relapsed after two years it was noted that in five cases the period was between ten and twenty-two years after operation. In 71 per cent. of the cases of relapse the age of the patient was over thirty years ; in 29 per cent. under thirty years.

We cannot, however, conclude from this that relapse is more common in adults than in children unless we know the relative number of cases operated upon under and over thirty years. My personal experience throws little light upon this question. It may be stated, however, as a general rule, that the chances of a permanent cure are considerably greater in children and young adults than in persons beyond middle life.

Indications for Operation. The results following operative treatment of hernia have shown such remarkable improvement during the past decade that operation may now be advised in a much larger class of cases than in former days. At the present time I believe that operation is indicated in children over four years of age in whom a truss has been given a fair trial without marked improvement ; furthermore, in cases complicated by fluid in the hernial sac (reducible hydrocele) which renders it impossible to effect a cure by mechanical means ; all cases of femoral hernia, whether in children or adults, unless contraindications be present, should be operated on without delay, for the reason that cure cannot be effected by a truss. The practice of operating upon infants under one year of age, or even two years, unless in very exceptional cases, I believe, is open to serious criticism. Umbilical hernia in infants and children should, with rare exceptions, never be operated upon, for the reason that they are almost invariably cured by truss ; but inasmuch as a cure by means of a truss is rarely obtained after the age of maturity, operation may be properly advised in all cases of young adults. Operation is attended with little risk to the patient, hence the prospect of a cure is extremely good. Operation should seldom be advised in patients over sixty years of age, nor should very large, irreducible herniæ, especially in stout women, be operated upon, since the risks are too great and the prospects of cure exceedingly small.

General Literature on Hernia. William J. Mayo,¹ of Rochester, Minn., reviews the various methods of operation for the radical cure of hernia. Since 1893, 204 cases have been operated upon by Dr. Mayo and his brother ; 164 cases were inguinal, with 5 known relapses ; 16 cases, with no known relapses ; 7 umbilical, with one known relapse ; 8 ventral, with no relapses ; 9 post-operative, with 1 relapse. As regards mortality, one case of inguinal hernia died of broncho-pneumonia during the second week ; another of uræmia after perfect healing of the wound.

¹ Annals of Surgery, January, 1899, p. 51.

Mayo regards Bassini's method as superior to all others, and upward of a hundred of the cases were operated upon by the typical Bassini method. He states that kangaroo tendon has been abandoned for catgut sterilized by the dry-heat method. The use of silver wire for buried sutures was abandoned in inguinal hernia for the reason that occasionally, even after many months, tissue atrophy over a wire suture rendered its removal necessary. He believes that buried silver-wire sutures in the upper part of the abdomen give less trouble than in the inguinal region. He limits their use to large umbilical and ventral herniæ.

W. B. De Garmo, up to November 12, 1898 (personal communication), has operated upon 466 cases: Czerny operations, 3; Barker operations, 38; femoral operations, 31; umbilical operations, 12; ventral operation, 1; Bassini operations, 381. Amputation omentum, 82.

Under fourteen years, 119 cases; none recurred, no deaths. Over fourteen years, 347 cases; 4 recurred; 1 died (Case 429).

Two patients operated upon for umbilical and double inguinal at the same sitting. One patient double inguinal and one femoral at one sitting.

Case 429 was a man about seventy years old, with a hernia reaching within four inches of his knee and over twenty inches in circumference. The operation seemed advisable on account of repeated attacks of strangulation and complete disability.

Recurrences have *all* been in men over fifty years old.

UMBILICAL HERNIA. Hiller,¹ of Stuttgart, reviews the newer methods of treatment of umbilical hernia, especially with reference to adults. As regards palliative treatment, he believes, with Champonniere, that in the adult there is no hope of permanent relief from the use of trusses or bandages, while, on the other hand, he considers operation contraindicated in young children and mentions a certain very simple sticking-plaster bandage, which has been successfully employed in their institutions in children as well as in some other suitable cases. The bandage consists in a strip of caoutchouc placed upon and extending somewhat above and below the hernial opening. This is sewed to a piece of perforated sticking plaster of equal width and fastened to the back of the patient, some slight pressure on the sides being exercised to slacken the tension of the abdominal surface. This bandage holds back the hernia without pressing upon it, and tends to draw the opening together. It is only after several weeks' rest that renewal of the bandage becomes necessary. Hiller states that while in many instances spontaneous cure ensues, it is by no means advisable to abstain from the use of artificial aids, especially since, if a hernia does not close within the first year of life, the chances of a spontaneous cure later on are much lessened.

¹ Beiträge z. klin. Chir., 1898, Band xxii., Heft 1.

As a further palliative measure which may render, except in very urgent cases, extensive operative interference dispensable, he mentions Schwalbe's alcohol injections, which are highly spoken of by the inventor as well as by others, and which aim to obliterate the hernial sac by producing a chronic inflammation of the same. In proof of the value of this method he states that although Schwalbe has had some recurrences, the proportion of his cures is greater, some of his cases having remained well from one to eight years without wearing any supporter, and part of them are doing hard work. Equally good results, he states, have been obtained by Langsdorf and Weinlechner, so that it may be worth while to give the method a trial in suitable cases, although the long duration of the treatment is a great inconvenience to the patient as well as to the physician.

I believe that umbilical hernia in infants and children up to the age of puberty are, with very rare exceptions, cured by support—*e. g.*, a pad and rubber plaster encircling the abdomen, and operation in these cases is contraindicated.

The alcohol injections I would not advise, as I believe them unnecessary in children and ineffective in adults. Any patient in whom the injections would offer a remote chance of benefit had much better submit to a radical operation.

In contrast to the various palliative methods employed, Hiller says a radical operation is the only means of thorough cure, and the earlier operation be undertaken, the better, since in the far-advanced cases even operation does not afford much hope of permanent cure.

From the literature, as well as from cases which came under observation Hiller has compiled a table of seventy-four cases of partially free, partially incarcerated umbilical hernia, in adults, that have been operated upon since 1872. The mortality of these cases was 19 per cent. ; cures, 81 per cent. ; 45 of the 74 cases were incarcerated, and of these 73 per cent. were cured, and 27 per cent. died, which corresponds to the statistics of Heyl, who had a mortality of 27 per cent. Far more favorable are the results in non-incarcerated hernia, in which the mortality was 7 per cent. ; cures, 93 per cent.

The two principal methods that come into consideration are : the one which leaves the tissues of the hernial opening and its surroundings intact, and the other which completely extirpates the umbilical ring (omphalectomy), and which was first described by Keen in 1888, and later improved upon by Condamin.

Of course, the main object of operation is to obtain as firm a closure as possible of the abdominal wall in the region of the old hernia, in order to guard against relapse. Simple as this may seem, it is by no means easy of accomplishment, and numerous operations with the view

of overcoming this difficulty have been devised and practised by various operators with more or less success.

Hiller considers the Condamin modification an excellent procedure ; but it, too, has its limitations, since, for obvious reasons, it cannot well be employed in cases with a very large hernial opening, admitting, say, five or six fingers. It is in such cases that he believes Steinthal's modification of the first principal method, which he describes at length, is indicated. This has been successfully practised by Hiller since January, 1893, and a series of sixteen cases (one child) reported by him, shows nine cures, the youngest being free from recurrence nearly six months, the oldest over three and one-half years ; two cases of severe incarceration died, one of peritonitis, which had existed before operation, the other after perfectly normal wound-healing, eleven days after operation, from recurrent pneumonia, of which he had the first attack just before operation ; one operated on according to the old method had relapsed ; one had an apparent lateral relapse ; one had been operated on too recently to be classed as cured, and two were not traced. The majority of these herniæ were of long standing.

Hiller's conclusions are : That for small and medium sized herniæ omphalectomy, according to Condamin, would seem the most rational method, provided the patients are able to stand general narcosis.

In cases that do not seem suitable for general anæsthesia, Schleich's infiltration method affords a splendid means of performing radical operation without any danger. In these cases, however, the method as practised by Steinthal seems the most efficient.

Permanent results of radical operation for umbilical hernia are not alone dependent upon the permanent closure of the abdominal wall ; there are certain methods of suture by which a firm cicatrix is insured. However, the operation itself does not remove the cause of the hernia, viz., the disproportion between abdominal contents and abdominal space. Where this disproportion is not overcome new herniæ may develop in other weak parts.

As to suture material, Hiller states that silver wire has been found most efficient for buried sutures.

Final Results of Radical Cure in Operations During the Last Decade. I have collected reports of 10,500 cases operated upon, with few exceptions, since 1890, with a mortality of $\frac{1}{10}$ of 1 per cent.

Roux, of Lausanne, has operated upon 1398 cases, with 5 deaths, and of 324 traced beyond two years, 54, or 16.7 per cent. relapsed. Most of his cases were operated upon by the method of Ferrari. Broca, of Paris, has operated upon 1064, with 9 deaths. ; Colzi, of Florence, 1586 cases, with mortality not stated ; Champonniere, of Paris, 650 cases, with 5 deaths ; Halsted, 309 cases, with 1 death ; Kocher, 280 cases, with 1

death; De Garmo, 466 cases, with 1 death, and 428 consecutive cases without a death. Rodman, 79 cases, with no deaths. Coley, 600 cases, with 1 death, and 489 consecutive cases without mortality.

As regards final cures, few surgeons have traced any large series of cases sufficiently long to determine the permanency of the cure. Roux had 54 relapses in 324 cases traced beyond two years; Bassini, 7 relapses in 251 cases; Macewen, 5 relapses in 224 cases (107 traced, 93 well two to ten years); Halsted, 12 relapses in 221 cases; De Garmo, 4 relapses in 466 cases; Kocher, 15 relapses in 280 cases (171 traced); Czerny, 9 relapses in 105 cases; Coley, 5 relapses in 514 cases (Bassini operation), and 1 relapse in 40 cases (femoral hernia); 338 well one to seven years after operation.

APPENDICITIS.

While great progress has been made during the last few years in the treatment of appendicitis, we have not yet reached the point where there is unanimity of opinion among surgeons and physicians as to the best method of treatment of acute appendicitis. Nearly all agree that every case of chronic or relapsing appendicitis should be operated upon, and most surgeons are coming to the point of advising operation after one attack, provided the diagnosis is free from doubt.

The same agreement is not found in the matter of acute cases, and here we have two well-defined groups—the one advising operation in all cases as soon as the diagnosis is made, and the other advocating the policy of careful watching of the individual case; treating many by means of absolute rest, ice to the abdomen, and laxatives, and by these means tiding the majority over the acute period to have the appendix removed with greater safety in the quiescent or afebrile period.

I believe the greater number of representative surgeons of the world is at present to be found in the second group. In discussing this question the radicals, or interventionists, usually develop their argument somewhat as follows: All cases of appendicitis are amenable to cure if operated upon sufficiently early; all deaths are due to delay; *ergo*, the proper treatment of all cases should be operation as soon as the diagnosis is made. The serious defect in this reasoning is that the surgeon is supposed always to be at hand and able to operate at this indefinite point of time—"sufficiently early"—in the development of the disease. If this were true the majority, if not all, of the conservatives would quickly go over to the other side and favor operation in all cases. The facts as determined by actual practice are very different from theory, and in the larger proportion of cases of acute appendicitis by the time the surgeon first sees the patient the period when anyone can say with

assurance that immediate operation will certainly save the patient has already passed, and there is ample room for the exercise of the highest surgical judgment in determining whether immediate interference or watchful delay will be most likely to bring about recovery. Thirty-one of Richardson's cases were practically moribund when first seen by the surgeon. In many cases the diagnosis cannot be made, even under the most favorable conditions, until this period of "the safe operation" has passed, and hence it is folly to argue that there is no need of having any mortality from appendicitis if the policy of early operation is adopted.

In the following pages I have attempted to set forth the present views of the leading surgeons upon this most important question.

Richardson and Brewster's Views. Richardson and Brewster¹ publish their conclusions based upon a personal experience covering 756 cases of appendicitis, including 150 consecutive cases operated on "in the interval."

The chief points discussed are the question of immediate operation in acute cases and the question of operating in the quiescent stage.

A study of the fatal cases brings out some important facts: 221 chronic cases were seen, of which number 151 were operated upon with no mortality; 149 acute cases were seen which recovered without operation; some of these were operated on afterward in the quiescent stage. There were 63 deaths after operation in the acute cases, and 31 patients were moribund when first seen, dying almost immediately. Of 221 cases of recovery after operation the appendix was removed in 112 cases, and in 100 cases the abscess was simply drained. Of 464 acute cases 284 were operated upon, with 63 deaths, or a mortality of 22 per cent. This large mortality is explained by the fact that the infection was far advanced, and "in almost every case there was found to be general peritonitis." Some of the cases were so hopeless that with our present knowledge operation would be refused.

As to the causes of death in the remainder of the cases, it is stated that in one or two death was due to pulmonary embolism; in some, to acute septicæmia, and in several cases to a secondary abscess, even after removal of the appendix. It is also noted that in some of the fatal cases a localized infection was made general by direct contamination of the healthy peritoneum in spite of all efforts to prevent this accident.

This is in contrast with the experience of leading French surgeons, as expressed at a recent discussion on appendicitis at the Society of Surgery of Paris. They stated that they had never seen general infection follow local infection from direct contamination due to searching for

¹ Boston Medical and Surgical Journal, 1898, No. 2.

the appendix. Morris¹ believes it better to work rapidly in separating adhesions, using no gauze to wall off the general cavity, and allowing the pus to flow freely everywhere in the peritoneal cavity, relying upon hydrogen dioxide to prevent infection.

Richardson believes that the danger of converting a localized abscess into a general one under certain conditions is real, and one that demands more consideration than it receives. He believes that a general infection thus occurring is of a very severe type, almost always fatal, and adds that this type of case is seen most frequently on the third or fourth day. In most of the fatal cases death occurs less than twenty-four hours after operation.

Richardson states that "in view of the cases of similar severity and similar local signs which have recovered without operation, and which have later been subjected to the so-called "interval" operation, it seems to us clear that the question of interference on the third or fourth day should be most carefully considered."

In cases attended with abscess formation, especially those in which there are several foci of pus, Richardson and Brewster believe that the method advocated by Dr. Harrington is the best: The incision is made toward the median line well inside of the tumor, the aim being to open immediately the peritoneal cavity before separating the adhesions about the appendix. In this way information is at once obtained as to the condition of the general cavity of the peritoneum. The next step consists in walling off the infected area very carefully with gauze. The appendix is then separated with the finger and its locality drained and disinfected. Cases with localized abscesses of a week or more in duration practically all recovered under simple drainage, and those cases associated with gangrene and perforation of the appendix usually recovered if the tumor was small and well localized. Many recovered with demonstrated general infection and many after extensive contaminations during operation.

In regard to those cases in which simple drainage was employed, Richardson believes that this method is advisable in many cases. He would limit it practically to the same class of cases for which it is recommended by the French surgeons, namely, cases of long standing, a week or more, in which there is an abscess with firm, thick walls. In addition to this class of cases he would employ it in other localized collections as soon as the patient's condition make it appear unwise to attempt a prolonged search for the appendix. The reasons given for employing the method in these cases are that recovery nearly always follows, making it possible to perform with perfect safety a second oper-

¹ New York Medical Journal, April 29, 1899.

ation in which the appendix can be removed, and that the ventral hernia which is so likely to follow operation in the acute stage may be avoided.

He states that in a considerable number of abscess cases treated by drainage there was evidence of complete gangrene of the appendix. He has not up to the present been able to convince himself that there is any considerable number of recurrences following drainage.

A secondary operation is advocated in those cases in which a hernia develops in the scar or in which signs of discomfort persist in the region of the old trouble. Fecal fistula frequently follows the removal of the appendix in cases in which there has been an extensive suppurative process, but these fistulæ almost without exception heal spontaneously.

Richardson and Brewster believe that the site of the perforation greatly influences the prognosis. It was thought that the fulminating cases depend upon bacteriological considerations, sluggishness of the peritoneum in setting up adhesions and, possibly, to other causes not so clearly understood. The violence of the infection also depends very largely upon the size of the perforation, the patency of Gerlach's valve, and the liquidity of the cæcal contents. The rapidly fatal cases, in which an exploration shows in the first few hours a fatal peritonitis already well developed, not infrequently show perforation near the base of the cæcum.

In regard to the question of operative interference their conclusions are clearly set forth and may be regarded for the most part as in accord with the present opinions and practice of the more conservative American surgeons. They believe that the question of operative interference is not so simple as it first appears—that the greater one's experience in all classes of acute cases, the greater the number in which there will be serious doubts as to the advisability of interfering as soon as the diagnosis is made.

They strongly emphasize the very important point, one frequently overlooked in such a discussion, namely, the difference between advocating operation at the *beginning* of the disease and when *diagnosis* is made. While the rule of operating in every case at the outset of the disease may be a good one, it by no means follows that immediate operation is demanded in every case as soon as the diagnosis of appendicitis is made, for the reason that when the patient comes to the physician for treatment or to the surgeon for operation, the conditions favorable to an early operation may have given place to others, making operation far more dangerous than expectant treatment. They believe that most of the severe cases seen after the symptoms are fully developed require interference at some time during the attack; but that this time is invariably as soon as the diagnosis is made, is a proposition open to serious doubt. They would not operate on a patient in whom a severe attack

is rapidly subsiding so long as the symptoms improve. Any increase in the severity of the symptoms after a temporary improvement invariably demands an operation, and an operation will be attended with greater chances of success at the end of a week than on the third or fourth day. In those cases in which no improvement, but an increase in the severity of the symptoms, has been noted, operation should be immediately performed. They say that in many of their successful operative cases the interference was postponed from day to day until it was clear that recovery without operation was not likely to occur. In some cases—a very few—the operation proved fatal. In others the patients, after delay, died suddenly without relief. They believe that operation ought to have been performed in a certain number of these cases, though, on the other hand, they confess that operation was performed on several occasions when subsequent developments showed that it would have been better policy to wait.

This is an answer to those who advocate operating on all cases as soon as the diagnosis is made and who state that no one has ever regretted operating upon a case of appendicitis. Richardson and Brewster state that those cases which proved fatal after operation may be quoted either in favor of earlier interference or of no interference at all. They believe that it has been proved that the earlier the operation up to a certain time, say the second or possibly the third day, the lower the mortality; but, unfortunately, an operation before perforation is frequently impossible, for the reason that the first symptoms in severe cases do not develop until the contiguous peritoneum about the appendix has already become infected.

The statistics of the cases treated medically are exceedingly interesting. Of 180 acute cases treated without operation, 31 died, a mortality of 17 per cent., which is lower than that obtained after operation in acute cases. They reason very fairly, and state that some of these thirty-one cases which died under medical treatment might have recovered had they been operated upon; while, on the other hand, of the sixty-three fatal cases operated upon, they believe that a considerable number died which in all probability would have recovered under medical treatment. They conclude that:

“The truth is that had all these cases been seen by experienced surgeons in the first or second day, practically every fatal case would have been operated upon at a time when there would have been a strong probability of cure. But, furthermore, on the other hand, a certain number of the successful cases not operated upon would have been hastened to their death, and a certain number would have been drained late in the period of safety, for it must not be forgotten that many a case proves fatal before aid is called, and that the late operations are

successful in a large ratio, because the cases being 'the fittest have survived' the dangers of the early and critical days."

In regard to operating during the quiescent stage or in the "interval," they state that in the hands of the most experienced operator the death-rate is less than 2 per cent.; they have personally operated upon 151 cases since August, 1894, without a single death. They state that years of immunity after one attack of appendicitis give no security against a second, and add that in several of their worst cases in adults the first attack occurred in childhood. As regards the cases operated upon during the interval, in no instance did they fail to find the appendix and remove it, although the operation was extremely difficult in some cases. In all chronic cases, except the earliest, McBurney's incision was employed when possible.

In regard to the question of drainage in operations during the interval, their rule is as follows: In cases in which the appendix or its surroundings have a suspicious look, where they have seen yellowish masses or distinct pus, drainage was invariably employed for forty-eight hours. This does not interfere with the rapidity or completeness of the convalescence. They state that several of the cases which have been fatal in the hands of other men have been sewed up without drainage.

With reference to operating during the acute attack, they state that they are more inclined to conservatism than formerly. A point of very great importance is mentioned, namely, the distance of the patient from surgical aid. While one may safely watch for the most favorable moment for operating in a hospital, the same plan would be impracticable in a remote town. Their final conclusions are that the safety and efficacy of the interval operation make it desirable, whenever possible, to bring the patient through his acute attack without operation.

This is in harmony with the views of leading European and American surgeons, though strongly opposed by the radical minority.

TREATMENT OF THE STUMP. Concerning the technique of the removal of the appendix, their plan is to tie off the appendix and its mesentery with silk, great care being taken to guard against hemorrhage. The actual cautery is used to separate the appendix, the stump is burned close to the ligature, depressed into the cæcal wall and buried there beneath four or five fine silk sutures. The wound is closed by one or more silkworm-gut sutures. Convalescence requires two weeks, patients going home on the fourteenth day.

Morris's Statistics. Robert T. Morris, of New York, has kindly furnished me with his most recent statistics. He has operated upon 221 cases, with 10 deaths, or a mortality of $4\frac{1}{2}$ per cent. In 76 of these cases operation was performed in the quiescent stage without mortality, hence the mortality of the 145 acute cases is 7 per cent. In 50 of the

acute cases operation was performed before the formation of an abscess or of "liquefied lymph," therefore the mortality in the 95 cases of acute suppurative appendicitis would be $17\frac{3}{10}$ per cent. Morris is an enthusiastic advocate of operation in all cases as soon as the diagnosis is made, and he furthermore believes the diagnosis easy.

Deaver's Plan of Treatment. Deaver,¹ of Philadelphia, gives what he considers important points in the technique of the operation for appendicitis. He states that he uses both the incision parallel to the semilunaris and the oblique incision, and believes that the choice depends upon the character of the case to be operated upon and the individual preference of the surgeon. The leading French surgeons favor the oblique incision. He holds that the incision at the semilunar line offers as good a chance for perfect union in most cases as the one which splits the muscle.

In view of the evidence already presented by Woolsey, I cannot agree with this statement of Deaver's.

Deaver believes that the incision should be as small as possible. In chronic cases with few adhesions, he states that in most instances he takes out the appendix through an incision that will admit the index finger. In non-suppurative cases his results, as far as hernia is concerned, have been excellent. With but few exceptions he advises against the use of an abdominal supporter.

In regard to sutures, he states that in all buried sutures he uses silver wire, and adds that from his work not only upon the belly walls but also in connection with the radical cure of hernia, he is convinced that silver is the ideal material for the buried sutures. In another place (see Hernia) I have discussed the disadvantages of non-absorbable sutures in hernia operations, and I believe that these disadvantages hold good in operations for appendicitis as well as for hernia.

Deaver discusses at some length the question as to the advisability of removing the appendix in acute cases. He states that those who advocate leaving the appendix belong to the class of surgeons whose experience is limited in this kind of work, it being his belief that the appendix should be removed in the majority of cases. He thinks it incomplete and dangerous surgery to leave a gangrenous or perforated, in short, an infected, appendix within the abdomen. In the great majority of instances more lives will be saved and fewer complications met with, if the appendix is removed. He states that in cases where the incomplete variety of surgery has been done he has frequently had to operate not only to save the patient's life, but to correct the defect of the original operation. With the proper disposition of gauze he believes that the

¹ *Annals of Surgery*, January, 1898.

appendix in the presence of pus or infected material can be removed with safety. His advice to the occasional operator or one unfamiliar with abdominal surgery in general, is to be cautious in performing a radical operation.

I believe that the position of Deaver in regard to the removal of the appendix is unquestionably the correct one. In but a single case have I found it impossible or, rather, injudicious, to remove the appendix. If the intestines be protected with sufficient care and the adhesions slowly and skilfully separated, I believe that the danger of seeking out and removing the appendix is, in the great majority of acute cases, very materially less than the danger of a subsequent attack if the abscess be simply opened and drained and the appendix left behind. I have operated upon one patient with a very severe attack of acute appendicitis three years after an incomplete operation had been performed. The appendix was found perforated, gangrenous, and buried in a mass of dense adhesions. It was found and removed with some difficulty. The patient recovered. Operation and removal would certainly have been infinitely easier three years before, and the patient could have escaped the very serious risk of the subsequent attack.

TREATMENT OF THE STUMP. Deaver excises the appendix, cutting it out completely with a pair of curved scissors, believing it to be just as simple to close a wound in the cæcum, and often simpler, than to close a wound of the wall of the intestine elsewhere. Drainage is employed only in pus cases.

Views Expressed Before the French Society of Surgery. POIRIER, of Paris, at the meeting of the Surgical Society, July 6, 1898, summed up the treatment of appendicitis in this simple formula: "Acute appendicitis in all its varieties and degrees should be operated upon as soon as possible." The fact that this statement of Poirier started a discussion upon the treatment of appendicitis, the most spirited and prolonged in the history of the society, would prove that the formula laid down by him was not acceptable to a large number of French surgeons. Inasmuch as the leading surgeons of France have taken an active part in this discussion, we may look upon it as the most representative and authoritative recent expression of French opinion on this important subject.

In addition to the formula already mentioned, Poirier goes even further and states that he believes that "*il (the surgeon) guerit toujours lorsqu'il est appelé à temps*"—the surgeon always cures when he is called in time. He says that he has never known a contraindication to operation, and adds that in the rare cases to-day in which the surgeons have not been able to save their patients they have regretted either not having been called in time, or having intervened too late. In his own

experience he has never repented having operated. The fact that fewer deaths from appendicitis occur than formerly is due to the fact that the disease is earlier recognized and the surgeon earlier called. Death from appendicitis in the majority of cases he believes due to the fact that the surgeon was either called too late, or temporized. In spite of earlier and lengthy discussions, he believes that there are certain important questions in regard to which, at present, surgical opinion is divided :

1. In those cases in which an abscess is present should the surgeon simply open the abscess and drain, or should he search for the appendix and attempt to remove it ?

2. At what point should the appendix be resected ?

3. When should one open and wash out the general peritoneal cavity ?

These are, indeed, most important questions for solution, and upon most of these points English and American surgeons differ quite as widely as the French, though I believe we are able by careful study of these various views to discover the present trend of opinion.

Poirier believes that an operation is incomplete if an abscess about the appendix is simply opened and no attempt made to remove the latter. From his personal experience he believes that removal of the appendix is always possible and once only has he failed to accomplish this. It is his opinion that the appendix should always be removed entirely, for the reason that if a portion of it is left behind the patients not infrequently suffer for years after operation. He does not believe harm results from opening the general peritoneal cavity to search for the appendix. In his own operations the peritoneal cavity is almost always opened, and he has never seen a case of peritonitis resulting from operative infection.

The following are a few of the more important facts and opinions brought out in the discussion :

RECLUS does not believe it always necessary to search for the appendix when opening a simple abscess. While some invariably remove it, and others never, he is inclined to adopt a middle course. He believes that it is usually better to search for the appendix, for by so doing small abscesses are frequently found which without this step might escape notice.

BRUN, however, states that the appendix should be sought for and removed whenever possible, in order to prevent a recurrence of the trouble. His experience differs much from Reclus', inasmuch as in his own personal practice he has seen three children who were operated upon under these same conditions, on whom it was necessary to reoperate later to remove the appendix, because in two cases a fistula persisted, and in the third, recurrent attacks followed after primary operation. He believes that removal of the appendix is important and always practices

it when called upon to operate during the first few days following the formation of the abscess. He states that he has never seen accidents follow this practice, especially has he never seen peritoneal inoculation result. He thinks that there are certain rare cases in which it would be wiser not to attempt the removal of the appendix, such cases being those in which the abscess has developed slowly, and in which it is limited by coils of intestine with soft and friable walls. In these cases he would abstain from removing the appendix, not from the fear of general infection so much as from that of rupturing the intestinal wall, thus giving rise to fecal fistulæ.

In regard to the general question of operating upon all cases of appendicitis as soon as the diagnosis is made, Brun does not agree to the formula of Poirier. He believes that everything depends upon the duration of the appendicitis. If called at the onset or in the first four or five days, he always begins with medical treatment: absolute rest, diet, ice to the stomach, ice to the abdomen, and morphine, and in the great majority of cases the symptoms improve and enable us to remove the appendix in the interval. He states that the medical treatment, such as has been mentioned, is so often efficacious as to have considerably diminished the number of cases of appendicitis which in his own service he has been obliged to operate upon during the acute attack. Especially in children do these acute attacks subside under medical treatment, thus permitting removal of the appendix three or four weeks later, when the element of danger is almost entirely eliminated. He believes that we should never prolong medical treatment if no modification of temperature has occurred after from twenty-four to forty-eight hours, advising operation in such an event. In cases of septic appendicitis he would operate as soon as possible. These cases, he thinks, it is fairly easy to diagnosticate by the rapidity and feebleness of the pulse, facial expression, and abdominal tenderness.

RICARD protests very strongly against the position taken by Poirier.

He believes that a formula so absolute should find no place in the treatment of an affection so variable in its forms as appendicitis. He holds that appendicitis should be divided into three different categories:

1. In which there is no difference of opinion as to the propriety of operation.
2. In which some would advise in favor of and others against operation.
3. Cases of acute appendicitis in which surgical intervention must be abstained from.

The first category comprises cases of acute perforating appendicitis with diffuse peritonitis, as well as cases of suppurating periappendicitis with iliac abscess. In these two classes of cases there is no room for

debate ; while the therapeutic results may vary, indication for surgical intervention is indisputable.

The second category includes those cases of moderate intensity, and these, in Ricard's opinion, should not be operated upon as soon as the diagnosis is made, for the reason that an operation performed during the acute stage of the disease is attended with greater risk than one that is performed during the quiescent stage, and furthermore, certain cases are completely cured, the trouble disappearing without leaving a trace and never recurring.

Every case of acute appendicitis observed from the outset, no matter what the violence of the symptoms, Ricard would first treat by medical means, namely, absolute rest, diet, opium, and ice to the abdomen. In addition to this he would insist upon the most rigorous observation of the patient, watching especially the pulse and temperature. During all this time he would hold himself in readiness to intervene at the first moment that alarming symptoms develop, or if the symptoms already present are slow in improving. Like Brun, since adopting this method of procedure he has found fewer and fewer occasions for operating during the crisis of the disease. If the medical means referred to succeed in arresting the development of the appendicitis he would continue patiently, and if, after the fall of temperature the trouble persists, however slight it may be, and there remains a localized lesion perceptible to palpation, tenderness on pressure, intestinal troubles, or even simply a slow return to general health, he would operate several weeks afterward during the quiescent stage. If, however, everything has become apparently normal after several weeks, the symptoms having disappeared, and there be no tenderness or swelling remaining, he would advise against all operation. Whenever the trouble recurs once or oftener, operation should be performed without further hesitancy.

In addition to these varieties there are light cases, such as have been described under the name of "appendicular colic," in which medical treatment is entirely justifiable. The symptoms in these instances usually disappear in a few days, sometimes in a few hours.

In regard to the question of removing the appendix in cases associated with periappendicular abscess, Roux, of Lausanne, at one of the recent congresses of surgery, stated that "a patient could never consider himself cured until he had his appendix in his pocket." Ricard believes that the surgeon should make every effort to search out the appendix and separate it from false membranes and purulent foci ; that in the great majority of cases he will find it but that there will sometimes be cases in which it is unwise to insist on this search for the appendix, especially in the cases already referred to by Brun, in which the appendix is lost in the midst of false membranes which glue it firmly to altered coils of

intestine with friable walls. In a case where suppurative appendicitis has existed for several weeks, forming a large abscess filling up the right iliac fossa, Ricard was unable to find the appendix. The cæcum itself was almost entirely lost in an immense mass of indurations, and he was content to drain the cavity.

In reality he believes that the difficulties attending the treatment of appendicitis have their origin in the anatomical uncertainties of the diagnosis. What is the exact lesion of the appendix in such and such a case? In what way will it result? In suppuration, in peritoneal infection, or in resolution? While some oppose intervention and others would operate on all cases, he believes that these are both extreme opinions, and that the truth lies at some place between.

BROCA, in regard to the question of operating immediately without first trying medical treatment, says that those patients who die of generalized peritonitis have almost all passed through a period during which the infection was localized in the neighborhood of the appendix, and, consequently, curable. Therefore it seems to him the most reasonable to conclude that operation should be performed as soon as the diagnosis is made.

In reference to removal of the appendix in abscess cases, he agrees with Brun, that the appendix left behind is capable of causing trouble.

This, however, is not the rule. Several times he has had occasion to operate for ventral hernia in which he found the appendix reduced to a small indurated white cord; while in other cases, again, he has found the appendix large, adherent, inflamed, and filled with calculi; in some instances the wound remained fistulous, or successive abscesses followed. In all, he has operated upon twelve ventral herniæ following primary operations for appendicitis; in four of these he had to dissect out the diseased appendix. In four cases that were not followed by ventral hernia, a fistula persisted once.

As to operation during the quiescent stage with resection of the appendix and exact careful suture of the abdominal wall, this has the advantage of avoiding ventral hernia, and the operation is perfectly free from danger. In spite of the comparative safety of the operation, Broca does not advise operating upon patients who have had a single attack unless tumefaction and pain on pressure persist. He would operate, however, after a second attack.

WALTHER also differs from Poirier. At the Surgical Society in December, 1896, he reported 17 operations, classed in the following way: 5 resections of the appendix, in the interval, with 5 cures; 2 opening of encysted peritonitis, with 2 cures; 10 operations during the acute attack, with 1 death. Among these cases he operated three times for a diffuse peritonitis, with two recoveries. At that period he operated as early as

possible in all acute cases, except in those in which the symptoms were extremely mild. Since that time he has changed his practice, and at present operates during the acute attack only in grave cases of septic peritonitis. As a comparison with the results of 1896, just mentioned, he offers his entire statistics during 1898. In the latter year he operated upon 27 cases of appendicitis; 23 during the quiescent stage, with 23 cures; 2 cases of encysted peritonitis, with 2 cures; and 2 generalized peritonitis, with 1 death. As will be seen he operated in only 2 cases during the acute stage, and in these, he states, he was influenced by the gravity of the symptoms. The results of the rapid intervention in 1896, compared with the temporizing and medical treatment in 1898, are practically identical, and he adds that he has never regretted having waited any more than he has ever regretted having operated.

As regards the removal of the appendix, he believes this step is worthy of far more importance than is usually given it. The fibrous transformation after one attack of acute suppurative appendicitis is by no means constant. There may be incomplete transformation, and still there may remain infected follicles which, after a long period, may be the source of trouble. Charlotte von Mayer, a pupil of Roux, showed the long persistence of foci infection in these remains of the appendix. In the cases operated upon since 1890 Walther has seen five cases followed by a second attack. Two of these patients were reoperated upon by himself during the interval; the remaining three by other surgeons, and he has recently had still another case in which three attacks have occurred following an operation performed four years ago. In this case he removed the appendix in the interval. He observed one case, that of a child twelve years old, which had been operated upon for peri-appendicular abscess. The patient was apparently cured when a new abscess developed, which opened spontaneously in a cicatrix. Later on a third abscess developed, resulting in peritonitis, for which operation was performed. The patient, however, did not survive. Altogether Walther has observed twelve cases in which the abscess was opened and the appendix not removed, and in which, after a longer or shorter time, recurrent attacks followed. In general these recurrent attacks took place early, for example within one, two, or three months, more rarely at the end of six months after operation. It is impossible to say when a patient is cured of iliac abscess, because the fact that he has remained free from recurrence two or three years is no guarantee that he may not have a return of the disease many years later. In view of these facts, Walther states that the opening of a periappendicular abscess by no means assures the permanent obliteration of the appendix and complete cure; either an intermittent fistula may remain, a new abscess may form, or there may be simply pain in the iliac region, accompanied by digestive

troubles, any of which possibilities would furnish sufficient reason for intervention. The arguments which, to his mind, militate in favor of expectant treatment are, that it enables us in most cases to operate during the quiescent period under far better conditions, with greatly decreased risk. It furthermore enables us to avoid the great danger of ventral hernia.

CHAPUT is an enthusiastic supporter of Poirier in the policy of early operation in all cases. He believes that the treatment of acute appendicitis is an all-important subject which should engage the attention of every surgeon.

French surgeons, he says, are divided into two opposing camps. On the one side are Dieulafoy, Reclus, Poirier, Potherat, and Tuffier, who declare that all cases of acute appendicitis should be operated upon as early as possible. On the other side are the opportunists, Broca, Routier, Ricard, Schwartz, Guinard, Repnier, Lejars, and Walther, who advise letting certain cases wait for operation in the interval.

Chaput states that there is as much accord among the first group as there is discord in the second. The differences of opinion among those who would wait are so profound that Chaput does not hesitate to declare that systematic operation in every acute case is the only rational and logical treatment, and is alone capable of assuring a cure, while expectant treatment must compromise the life of the patients in a considerable number of cases. In support of his advocacy of early operation in benign cases he cites two cases in which the symptoms were so mild that the majority of surgeons would not have operated. In both cases operation revealed a condition which might have given rise to a fatal peritonitis at any moment, and Chaput believes that these cases would have died in the hands of the "expectant" surgeon. He lays stress upon the fact that oftentimes the symptoms of peritonitis are very slight and easily overlooked.

In answer to the argument of the conservatives, that operations in the interval give a lower mortality, Chaput says that this is not strange, since the cases likely to die from any operation have already been eliminated.

Chaput asks: "How many times would the statistics turn against the opportunists if they would give, along with their mortality following operations in the interval, the mortality of the operations performed during the acute stage after varying periods of waiting."

In answer to this question, I would state that the surgeons representing the conservative side in the treatment of acute appendicitis have no desire to present any one side of statistics to the exclusion of the other. Both are fairly given by Richardson. Their sole aim is to get at the truth, and if it can be conclusively shown that more lives can be saved

by adopting the plan advocated by Poirier, Chaput, and others in France, and by Murphy, Deaver, and Morris in this country, the conservatives will be glad to become the most ardent interventionists.

Thus far I do not believe that the advocates of operating immediately have by any means proved their case. The question is an all-important one, and all new evidence, no matter from what source or on what side, should be welcomed. The very large number of cases reported by Richardson (750) furnish most valuable material for a study of the question, but, unfortunately, it is possible for both sides to draw an almost equal amount of encouragement from them. The comparatively high mortality following operations in acute cases will be cited by the "radicals" as evidence against the policy of waiting, while the absolute safety of the operation in the interval—151 cases without a death—will be pointed out by the "conservatives" as a reason for attempting to pilot the patient through the acute attack in order to have the appendix removed with safety in the interval.

In spite of the continued zeal of the radicals there is undoubtedly at present a growing tendency among the representative surgeons of the world toward conservatism in the treatment of acute appendicitis, and this tendency, I believe, is fully warranted by a careful study of all the data at present at our command.

ROUTIER,¹ in reply to Chaput, stated that he had sometimes regretted having waited, but never having operated too soon. During 1897 and 1898 Routier operated on 93 cases of appendicitis, on 35 in the interval, with 35 cures; on 33 cases of acute appendicitis, localized, with or without abscess, out of which 32 recovered and 1 died; on 24 cases with peritonitis, of which 13 recovered and 11 died.

Berger maintains that it is impossible, in actual practice, to lay down rules for the treatment of appendicitis that will be satisfactory in all cases.

Result of Kümmel's Investigations. Kümmel² reports the results of a careful clinical and microscopical study of 104 cases of relapsing appendicitis operated upon in the interval without mortality. Careful examination of the appendices removed showed that in no case had the organ returned to its normal state. The most common lesion was a hard, contracted condition of the appendix. Kümmel believes that clinical symptoms are by no means a certain index of the stage or variety of the inflammation. His cases are divided into five groups:

1. Those with the appendix in a state of chronic inflammation; 21 cases.
2. Those cases in which there were present ulcerations and strictures; 32 cases.

¹ Bulletins et Memoires de la Soc. de Chir., February 21, 1899.

² Berlin. klin. Wochenschrift, April 11, 1898.

3. Cases in which there were present inflammation, ulceration, and perforation ; 33 cases.

4. Seventeen cases in which concretions were present, with or without perforation.

5. One case of extensive disease of the cæcum requiring resection of the cæcum and appendix.

From the stand-point of treatment, Kümmel divides cases of appendicitis into three groups :

1. The very acute form, with sudden onset and well-marked peritoneal symptoms, pointing to perforation or beginning peritonitis. In these cases immediate operation is indicated.

2. Cases of moderate severity, in which class he advocates medical measures, including opium, while carefully watching the symptoms. If there is no amelioration of symptoms after a short time, operation is indicated even in these cases.

3. Chronic cases.

The Pathology and Therapy of Inflammation of the Appendix.

Czerny¹ contributes a very valuable and exhaustive paper on this subject. According to the clinical aspects of the cases reported by him, he divides them into three groups :

1. Acute perforation of the appendix ; 15 cases.

2. Subacute perityphilitic abscesses ; 13 cases.

3. Simple chronic appendicitis ; 26 cases.

In these 56 cases there were 8 deaths, or a mortality of 14.3 per cent., a showing which must be considered as quite favorable in comparison with Sahli's statistics, comprising 7213 cases, with a mortality of 21 per cent. Czerny further remarks that nearly all of the fatal cases were really hopeless, in that extensive septic peritonitis was present in most of them prior to operation. Therefore he claims that in estimating the value of operative interference it would be but fair to separate the cases with an absolutely bad prognosis from those in which it is more favorable, since the former almost without exception result fatally, whether operated on or not. One might feel inclined to refuse operation in these cases were it not for the fact that occasionally a patient will recover, as happened in one of his reported cases. In the cases of chronic recurrent appendicitis there was not a single death due to operation, so that Czerny does not hesitate to state that he believes the interval operation almost without risk.

With reference to the question as to when operative intervention should be resorted to, Czerny takes issue with Rotter,² who would considerably limit the indication for surgical intervention. Rotter reports

¹ Beiträge z. klin. Chir., 1898, Band xxi., Heft 2.

² See his work on Perityphilitis, Berlin, 1896.

a series of 213 cases treated at St. Hedwig's Hospital, Berlin, and estimates that 192 of them were treated by internal medication, and claims 82 per cent. of "cures," arguing from this that operation should be greatly limited. In response to these claims, Czerny proceeds to show that the cases classed as "cured" by Rotter cannot justly be considered so. He states that the fact that a patient leaves the hospital apparently cured after a first attack of perityphlitis does not by any means justify Rotter in considering him cured, since we all know that recurrence in these cases may take place at any time. Czerny holds that not unless at least two to three years have elapsed should we consider a case as cured. He says, also, that if Rotter, according to his own statement, formerly took too radical a stand-point with regard to the question of operating in appendicitis, he thinks that he has now fallen into the opposite extreme.

Czerny gives his own views with regard to the question of operation as follows :

1. The first acute attack of appendicitis belongs to the physician. This attack may *either* subside without complication, in which case there is no indication for surgical intervention, *or*, sooner or later, under alarming symptoms of general or local nature (fever, acceleration of pulse, pain, dulness on percussion, resistance, etc.) may lead to perforation with abscess formation. Such an abscess *either* leads to progressive and threatening general peritonitis, marked by rapid pulse, local peritonitic phenomena, dry tongue, etc., in which event immediate surgical interference is indicated (laparotomy in the region of the cæcum, evacuation of the pus, resection of the vermiform process, or possible irrigation, with saline solution, drainage), *or* the abscess remains circumscribed, becomes encapsulated, and after the subsidence of the first severe symptoms shows no perceptible changes. Here, too, surgical treatment is called for (incision, removal of the appendix—if possible, primary, otherwise, secondary).

2. All chronic recurrent forms of appendicitis, be they purely catarrhal, ulcerative, perforative, or partially obliterative, belong to the surgeon, as they are a constant menace to the patient (operation in the interval).

LAPAROTOMY.

Laparotomy for Intestinal Perforations in Typhoid Fever. A very valuable contribution to the surgery of intestinal perforation in typhoid fever has been recently made by Dr. Harvey W. Cushing,¹ of the Johns Hopkins Hospital. Cushing reports four recent cases of laparotomy for

¹ Johns Hopkins Hospital Bulletin, November, 1898.

a perforating typhoid ulcer, and in one of these the abdominal cavity was opened on three successive occasions, with final recovery. Cushing's statement that surgical intervention offers practically the only hope in these cases, seems to be studiously overlooked, if we are to judge by the small number of reported cases. On a recent visit to the military hospital at Fort McPherson, Cushing was told that of thirty autopsies performed upon fatal cases of typhoid fever, perforation was found to have been the cause of death six times. This would attribute to perforation alone 20 per cent. of the fatalities, which corresponds closely with the percentage of Hare, of Brisbane, but exceeds by two-thirds the figures given by Fitz, which are 6.58 per cent. in 4680 cases. Cushing states that he does not know of a single instance of operation for the relief of typhoid perforation in the 2000 cases which died of typhoid fever in the field hospitals and elsewhere during the late war; and yet, if conservative statistics are relied upon, 10 per cent. of this number, or 200 deaths, must have been due to this cause. The four cases reported by Cushing are of great interest:

In *case one* there was an early diagnosis followed by immediate operation before peritonitis had set in, and recovery followed.

In *case two* perforation occurred at the end of the second week. The perforation was sutured and gauze drainage left in; a fecal fistula occurred three days afterward from a second perforation. The fistula closed spontaneously. On the second day symptoms of perforation occurred and laparotomy was performed. No perforation could be detected. Intestinal obstruction was present, but overlooked. Two days later a third laparotomy was performed for acute intestinal obstruction due to a band of omentum adherent to the second perforation. No peritonitis was present. There was early vomiting, prostration, abdominal pain, tenderness, and leucocytosis. The patient finally recovered.

Cushing believes that in certain cases it is possible from the clinical symptoms to foretell a perforation; at all events, they should put one on one's guard, so that the patient be kept more than ordinarily quiet, and plunging be omitted. The leucocytosis, which at the first operation furnished a clear indication, was quite misleading in the second, while in the third case, although the leucocytes numbered 20,000, no inflammatory action was found to account for the increase.

In *case three* perforation occurred at the end of the fourth week, after prolonged abdominal symptoms. General streptococcus peritonitis was present. Laparotomy was performed, the perforation sutured, but death occurred eight hours later.

In *case four* relapse occurred abruptly on the fifty-second day after the onset. There was sudden sharp pain in the abdomen, some nausea and slight vomiting, some distention, and the abdominal wall was somewhat

tense and tender on pressure. Four and one-half hours after the first appearance of the symptoms exploratory laparotomy was performed, but nothing abnormal could be found. The wound was closed without drainage, and the patient made an uneventful recovery.

Cushing regards the usual statistics of operations for typhoid perforation as misleading. He believes that two varieties of perforation should be recognized, in which the prognosis is widely different: one, the appendicular form, usually remaining localized on account of adhesions, and having the same surgical features and the same prognosis as similar conditions unassociated with typhoid; in the other variety perforation always occurs in the freely moving bowel, usually the lower end of the ilium. Fitz, of Boston, was the first to clearly distinguish between these two varieties, but found, however, only 3 per cent. of appendicular perforation in 167 cases. Of twenty cases of perforation observed at the Johns Hopkins Hospital there were two of the appendicular variety.

Cushing believes that a differential diagnosis can hardly be made, and is of the opinion that operative interference is indicated in both. He thinks it is far better to operate early—and needlessly, should it so happen—than to wait until symptoms of peritonitis appear, actually demonstrating perforation.

He considers that if abdominal symptoms—for example, the appearance of pain or tenderness in the right iliac fossa—occur in the course of the fever, they furnish urgent indication for a surgical consultation, and not until this is fully realized will the mortality of these cases reach the low percentage of operations for acute appendicitis and perforating gunshot wounds of the abdomen. He differs from W. W. Keen, who advocates delay until symptoms of shock occur, and who prefers to operate during the second twelve hours.

As regards statistics, the most recent are those of Westphal, quoted by Keen, giving 19.36 per cent. of recoveries in 83 collected cases. Finney, in 1897, collected 45 cases with 11 recoveries, or 24.44 per cent. Cushing believes that Monad and Vanvert's 12 per cent. of recoveries, more nearly represent the truth.

A sudden acute onset of increased abdominal pain is an all-important symptom. A pronounced drop in temperature is not an infrequent symptom associated with the onset of perforation. Disparity between pulse and temperature may also be a marked feature, the pulse being small and rapid during the fall of temperature, and the presence or absence of leucocytosis has also been given much importance. Finney states that of all the diagnostic signs of perforating typhoid ulcer, most reliance is to be placed upon the developing of an attack of severe continued abdominal pain, coupled with nausea and vomiting, and at the same time marked increase in the number of white blood-corpuscles.

Cushing believes that the presence of leucocytes is not an infallible sign of perforation, as it may disappear with the onset of general peritonitis. When the diagnosis is made, operation is indicated, whatever the condition of the patient.

Laparotomy for Gunshot Wounds of the Abdomen. Randolph Winslow,¹ of Baltimore, reports eight cases of perforating gunshot wounds with injury to the hollow viscera :

CASE I. Gunshot wounds of the small intestine. The patient was a man, sixty years of age, with four wounds of the small intestine in the neighborhood of the ileo-cæcal valve. Operation was performed on December 22, 1893, eighteen hours after the injury. The patient made an uneventful recovery.

CASE II. Gunshot wound of the stomach in a man, fifty-eight years of age. Operation was performed on July 4, 1895, a very short time after the injury. The perforation occurred in the anterior wall, and no fecal extravasation had taken place.

CASE III. The patient was twenty-five years old, colored. Operation was performed in September, 1895. Five perforations of the ileum were found and three of the mesentery. Operation was performed about two hours after the injury. The patient died of general peritonitis from an undiscovered wound at the junction of the ileum and cæcum.

CASE IV. In this patient, aged sixty-six years, seven perforations of the small intestine were found and sutured. Death from septic peritonitis ensued, and the autopsy revealed an additional wound in the sigmoid flexure; the wounds had been made by a pistol of large calibre, No 38.

CASE V. Gunshot wounds of the small intestine and mesocolon, with recovery. Colored boy, aged twelve years, was shot by a 22-calibre pistol on September 4, 1897. Five perforations of the jejunum were found and sutured, and one in the liver, which was packed with iodoform gauze. The patient made a good recovery. The operation was performed six hours after the injury.

CASE VI. Gunshot wound of the small intestine. The patient was a man, forty-eight years of age. He was operated upon September 6, 1897. Six ragged perforations were found in the small intestine and one in the great omentum. The patient made a good recovery. In this case the operation was performed two hours after injury.

CASE VII. Gunshot wound of the duodenum. The patient, colored, twenty-three years old, was shot on September 14, 1897. He had to be transported ten miles to the city before operation, which was performed eleven hours after the injury. A ragged wound, one inch long, was

¹ *Annals of Surgery*, 1898.

found in the duodenum, and from it blood, bile, and fluid were exuding freely. The peritoneal cavity was flushed with sterile water and carefully mopped out. A large glass drainage-tube was placed between the stomach and liver, and another in the pelvis, packed with sterile gauze. The case made an excellent recovery.

CASE VIII. Gunshot wound of the small intestine. Laparotomy; death. The patient, twenty-seven years of age, was shot on October 13, 1897. Laparotomy was performed two hours after the injury. Five perforations of the small intestine were found and sutured. The patient took the anæsthetic very badly, and operation had to be greatly hurried. Death occurred on the third day, apparently from acute sepsis. No overlooked perforations were found.

This is a remarkable series of cases of gunshot wound of the abdomen treated by one surgeon. Five recoveries in eight cases, or 62.5 per cent., is the highest percentage of recoveries with which we are familiar.

Poppert² reports a very interesting case of perforating shot wound necessitating five resections of the intestine. The case was that of a young man who had been shot in a duel, and it was not until four hours after the occurrence that he received surgical attention. Examination revealed that the small intestine had been perforated twelve times, its mesenteric attachment having been grazed by one of the shots. In addition to this there were five profusely bleeding perforations in the mesenterium. On account of the diameter of the wounds—having been inflicted by a weapon of 10.5 mm. calibre—it was found impossible to close them by simple Lembert sutures, and resection had to be resorted to. As the perforations were distributed over the entire length of the intestine, however, an attempt to include them in one or two resections would have necessitated the removal of the greater portion of the small intestine. Under the circumstances it was found that to make five resections was the best that could be done. The prognosis was very bad, especially in view of the heavy loss of blood that had occurred before the injuries were located. Peritonitis seemed imminent, since it was to be expected that much of the bowel-contents had meanwhile entered the abdominal cavity. Rapid procedure without prolonged narcosis seemed to offer the only hope of saving the patient. The operation was, therefore, completed without anæsthesia. For the first two resections a double row of continuous silk sutures were used; for the last three only single Lembert sutures. After replacing the small intestine, which had to be done under narcosis, as the patient could not stand the pain, there was found to be present in the peritoneal cavity a good deal of blood. It was impossible, however, owing to the dangerous condition of the patient, who threatened to collapse every moment, to attempt cleansing the abdo-

² Archiv f. klin. Chir., 1898, Band lviii., Heft 3, S. 691.

men or to search for possible further lesions. Rubber tubes and strips of iodoform were introduced and the abdominal wall closed up to 4 cm. The operation had lasted a little over two hours. The resected pieces of intestine measured from 4 to 24 cm. in length, and contained from two to four perforations each. The patient made a splendid recovery. At no time was there any fever, although during the first nine days there was considerable vomiting. He left the hospital at the end of five weeks. A very remarkable feature of the case is that peritonitis did not set in. Poppert explains this by assuming that the bacteria in the contents of the small intestine were of a slight degree of virulence, and believes that probably also the acute anæmia exerted a favorable influence.

Karg, of Zwickau, reported the case of a young man, aged sixteen years, with gunshot wound of the abdomen, the bullet entering a little below the umbilicus. Laparotomy was performed four hours after the accident. One coil of small intestine was resected, and fourteen other wounds were closed by Lembert sutures; the peritoneal cavity was washed out with sterile salt solution and the lower portion of the abdominal cavity drained by means of iodoform gauze. The patient recovered. Karg reports a second case, of a man twenty-eight years of age, in which the bullet entered four inches below the umbilicus. Laparotomy was performed three hours after the accident; nine perforations of the small intestine and colon were sutured and the peritoneal cavity washed out as in the preceding case. As there had been considerable escape of the intestinal contents, the abdominal cavity was drained. After prolonged suppuration of the lower part of the wound the patient recovered.

Zeller, of Berlin, also reports two successful cases of gunshot wound of the abdomen treated by laparotomy. The first case was that of a man, aged forty-five years. Four hours after the injury, symptoms of perforation having appeared, laparotomy was performed. Blood and fecal matter were found in the abdomen. Certain portions of the peritoneum showed fibrinous exudate. There were several perforations of the mesentery and omentum, which were bleeding freely; two perforations of the small and two of the large intestine were discovered. All were closed by means of sutures placed perpendicularly to the axis of the intestine. The peritoneal cavity was thoroughly sponged out by dry tampons, without irrigation, and the wound was closed without drainage. The patient recovered, but with a ventral hernia.

In the second case a bullet 10 mm. in diameter had passed through the abdomen transversely. Collapse from severe abdominal pain and biliary vomiting quickly followed. Laparotomy was performed one and three-quarters of an hour after the injury; a large quantity of blood

mixed with fecal matter was found in the abdominal cavity, and fibrinous deposits had already taken place in the peritoneum. Eleven perforations were found in the small intestine; all of these openings were closed by Lembert sutures placed at right angles to the axis of the intestine, dry gauze sponges being employed to cleanse the peritoneal cavity. The wound was closed without drainage. Complete cure followed in three weeks.

Intussusception. As an instance of the vast improvement in the recent technique of abdominal surgery may be cited the low death-rate of operations for intussusception. Prior to 1889 the mortality was 90 per cent. or upward. Since 1889 it has fallen to 22.2 per cent. A very valuable statistical paper upon this subject has been published by Edward Martin,¹ founded upon fifty-four cases, the histories of which he was able to obtain from personal letters from various surgeons. Of 40 cases not operated upon, but treated by water or air injection, 17 recovered, or a mortality of 57.5 per cent. Of 15 cases operated upon, 2 recovered, or a mortality of 86 per cent. This high mortality in the cases operated upon should not really militate against operative treatment, for the reason that operation was in most of the cases delayed until there was little hope of recovery from any method of treatment. Martin believes that with early intervention, as soon as it is found impossible to bring about reduction under an anæsthetic, great improvement in the operative mortality would result. Wiggin,² of New York, who has made a most careful study of this subject for several years, advises against distention, preferring operation. If distention is to be employed, however, he would use one and one-half pint of warm normal salt solution, taking care to have no greater pressure than would be secured by an elevation of three feet above the level of the patient. In 103 cases collected by Wiggin, laparotomy was performed 64 times, with a mortality of 67.2 per cent.

Resection of the Intestine for Cancer. Bramann, of Halle, has operated upon fourteen cases of cancer of the large intestine. In five cases the patient presented symptoms of intestinal obstruction. Six died a short time after the operation of collapse, or as a result of the obstruction; none died of peritonitis. Of the eight successful cases, one died the year following of metastasis. Seven others were still alive.

One case was particularly interesting. A tumor the size of a fist, movable and very painful, accompanied by elevation of temperature, proved to be a sarcoma of the intestine, and, curiously enough, in its centre it was softened and contained a branch of sweet marjoram 16 cm. in length. It is probable that this foreign body acted as the cause of the rapid growth of the tumor and its great sensitiveness.

¹ Therapeutic Gazette, June 15, 1898.

² Lancet, August 28, 1897.

Tuberculous Peritonitis. Nassauer¹ discusses the question of the value of abdominal section in the treatment of tuberculous peritonitis.

He states that although 1000 cases have been reported as cured, the period of observation after operation has been so short in the great majority of instances that they cannot be fairly classed as cures. By far the largest proportion of the cases thus far reported have been under observation less than one year. Winckel believes that five years should elapse without recurrence before a case can be considered as cured.

Parker Syme,² after reviewing the various theories that have been offered from time to time in explanation of the cure of tuberculous peritonitis by laparotomy, states that in his opinion we can do little more than admit that opening the abdomen produces such changes in the character of the peritoneum as to make it capable of destroying the tubercle bacillus. He estimates the danger of the operation at less than 3 per cent., and believes that sepsis is less likely to follow these operations than when a healthy peritoneum is operated upon. He states that tuberculous infection of the wound does not occur, that disinfectants are of no value, and that drainage not infrequently is followed by a permanent sinus. Instead of regarding pulmonary tuberculosis, not too far advanced, as a contraindication, he believes it an added reason for operation.

The estimates of different writers as to the number of cures effected by laparotomy vary widely. Some claim 80 per cent. and others 24 per cent. Sims believes a fair estimate is: Marked improvement in 70 per cent., permanent cure in 30 per cent. Keen believes that an operation is not always necessary, and that in a fair percentage of young persons the disease may be cured by proper hygienic conditions.

MALIGNANT DISEASE OF THE RECTUM.

A very recent and valuable contribution to the surgery of malignant disease of the rectum has been made by Wendel.³

He gives the results of operation for cancer of the rectum in Küster's clinic at Marburg since 1885. The results bring out very clearly the relative value of Kraske's operation as compared with the older or perineal method. It has become the fashion among American surgeons to adopt Kraske's operation for all cases of cancer of the rectum, believing that its results are so much more promising as to outweigh the higher mortality. Even Watson Cheyne, who is, perhaps, the best representative of sound and conservative English surgery, states that "while the

¹ *Münchener med. Wochenschrift*, April 19, 1898.

² *Medical Record*, April 2, 1898.

³ *Deutsche Zeitschr. f. Chir.*, January, 1899, Band 1., Heft 3 and 4.

perineal operation is suitable to some cases, in the majority it is best to employ one or the other of the methods which give good access to the part from behind, such as Kraske's operation or any of its modifications." In reviewing the results of the two methods, that of Kraske and the perineal up to 1896, Cheyne states that the mortality of the perineal method seems to be about 8 per cent., and that of the sacral method 18 to 20 per cent. As to the probable benefit of operation in a given case of cancer of the rectum, he said that of 100 cases operated upon by Kocher, Czerny, and König, the representative surgeons of Germany, 61 were not benefited—that is, would have been better off if left alone or treated by colotomy. Cheney would exclude from operation cases of rapid growth, cases deeply ulcerated, cases where the disease has passed through the wall of the rectum, as shown by fixidity, and rapidly growing tumors high up, even if not fixed.

The statistics reported by Wendel comprise the cases observed by Küster since 1885 at the Augusta Hospital, Berlin, at the Surgical Clinic, Marburg, and at the Private Clinic of Küster. The total number of cases observed is 126, 4 of which were not operated upon. The diagnosis was confirmed by microscopical examination in every instance. In 95 cases radical operations were done; in 25 palliative, and 2 were subjected to exploratory laparotomy. Of these 65.1 per cent were men, 34.9 per cent. women. Two cases were under the age of twenty years, and 11 over eighty years.

In proof of the statement of Cheyne, that more radical operations are practised in Germany, Wendel states that of Küster's cases the cancer was adherent to the vagina seven times; once to the uterus; nine times to the prostate; twice to the bladder. In 35 cases the periproctal tissues were infiltrated, and there was more or less enlargement of the lymphatic glands. Twice the entire rectum was infiltrated, and thirteen times the tumor was fixed to the sacrum. He states that it is Küster's opinion in regard to cancers of the rectum, as well as all other cancers, that a radical operation should be done whenever technically possible and the patient's condition permits of such an interference. In the cases reported three methods were employed:

1. The perineal method (Lisfranc).
2. The sacral method (Kraske).
3. Resection of the bowel after colotomy.

Fortunately, for comparison, an equal number of cases were operated on by the sacral and the perineal methods. In 8 of the 46 cases operated upon by the perineal method the tumor was extirpated without the entire rectal wall being severed. The remaining 38 cases were operated according to Lisfranc. Space will permit of only a very brief summary of the results.

Of the 20 cases treated by palliative operation, 5 died as result of the interference, and in the remaining 15 the average duration of life was ninety-two days. In view of the unfavorable results this operation has not been done during the last six years.

Five cases of colostomy were performed, with two deaths. The three patients that survived operation lived on an average one year and seven months.

Of the 46 cases operated by the perineal method, 8 died within three weeks, of causes more or less directly due to the operation. Of the 38 remaining, 35 were traced: 9 died within the first year after operation; 6 during the first and second year; 6 during the second and third year; 6 survived operation from three to five years, and 3 between seven and eleven years. With few exceptions all died of a return of the disease. Five are still alive, ten months, five and a half years, seven and a half years, eight and twelve years, respectively, after operation.

Of the 46 cases operated upon by Kraske's method, 14, or 30.4 per cent., died as a result of the operation; 26 of the remainder were traced to final results. Of these, 11 died within the first year; 5 during the first and second year; 2 during the third year; 2 died four years and three months, and seven years and two months, respectively, after operation, of other diseases; 5 are still alive from six to eleven years after operation, and 1 patient one year and one month after.

It is seen that the mortality of the sacral method is nearly double that of the perineal, and the final results, as regards cures, are much inferior. As Wendel points out, however, these figures should not be taken as a true indication of the relative value of the methods, inasmuch as in the larger proportion of the cases operated upon by Kraske's method the disease was so far advanced that the perineal operation would have been impossible. The duration of the wound-healing was much longer in the sacral than in the perineal, the average duration being sixty-four days in the sacral. In half of the cases primary union was obtained with an average duration of wound-healing of twenty-three to twenty-five days.

Wendel concludes that 9.4 per cent. of the cases on whom radical operation was performed have survived from six to twelve years without recurrence; seven patients who died between four to eight years after operation of other diseases remained free from recurrence; thus the total number of final cures is sixteen, or 16.8 per cent.

In addition to the statistics of Küster, Wendel has collected the most recent statistics of Kraske himself, of Hochenegg, and of Mikulicz.

Kraske has operated upon 80 cases by his own method, with 18.7 per cent. mortality and 6.2 per cent. cures.

Hochenegg operated by the perineal method (Lisfranc) six times, with

no deaths ; one of the cases remained free from recurrence until death ; 89 patients were operated on by the sacral method, with a mortality of 9 per cent., and 12.4 per cent. cures.

Mikulicz operated upon 57 cases by Kraske's method, with a mortality of 24.56 per cent. and 6.06 per cent. cures.

Combining these cases with Küster's cases, we have a mortality of 18.7 per cent., and 10 per cent. of cures.

By the perineal method Kraske has had no cases ; Hochenegg 6, and Mikulicz 9. Adding these to the 46 of Küster, we have 61 cases, with a mortality of 18 per cent., and 14.8 per cent. cures.

In view of the material at hand, Wendel concludes that there is no justification for ignoring the perineal method to the extent that it has been generally done. He states that in the above cases they have never beforehand decided on any of the methods under consideration, but have invariably proceeded according to the needs of each particular case. Whenever the cancer was within easy reach, well defined, and the bowel could be well closed, the perineal method was generally chosen. In cases where the carcinoma was located high up, or when it became necessary, owing to inflammatory infiltrations of the neighboring tissues, or to extension of the tumor to adjacent parts, to combat high-reaching fixations of the rectum, a sacral method received the preference. And here they varied between Kocher's method of extirpation of the sacrum and more or less extensive resection of the sacrum. On the basis of these principles it was possible, in one-half of the cases reported, to operate by the perineal method.

This plan adopted by Küster seems the only rational one.

GYNECOLOGY.

By JOHN G. CLARK, M.D.

THE INFLUENCE OF CASTRATION UPON THE FEMALE CONSTITUTION.

Now that the technical side of gynecological surgery has been developed so highly we naturally begin to ask for definite statistics as to the remote results of operations.

Reports from many countries and many gynecologists are at hand giving ample data upon which to base a very positive prognosis with regard to the immediate recovery of the patient, for, from a percentage mortality far above the middle point, the death-rate has rapidly decreased until it is now quite insignificant.

We are, however, in a very poor position to answer the questions of anxious patients concerning the permanent relief of many of their disabilities. To the lay mind there are the dangers and discomforts of physical disability from their ailments, on the one hand, and, upon the other, the unknown results of an operation.

A safe deliverance from both of these dangers is what the patient most anxiously seeks, and there is nothing which so reassures her as a direct statement with regard to what the immediate and remote results of the proposed operation are likely to be.

Innumerable questions are asked as to the various real and unreal complications and sequelæ of operations, and the surgeon who is able to answer these questions in nearest accord with the usual results will always have the most comfortable feeling after operation. Patients have vivid remembrances of these ante-operative consultations, and wide deviations from the prognosis given at that time will always be noted later to the surgeon's discredit.

A painstaking statistical review of cases, at varying periods subsequent to operation, is, therefore, one of the most useful lines of research now open to the investigator. As reliable literature along this line is rather scant, it is with no little pleasure that I take up a recent study by A. Pfister¹ concerning the remote effects of ovariectomy.

Pfister has traced as far as possible the histories of 179 patients operated upon between the years 1880 and 1896 by Kuhne.

¹ Archiv für Gynäkologie, vol. lvi. p. 583.

The results of his work are tabulated as follows: Reliable reports from patients, 116; died immediately after operation, 7; died later of intercurrent disease not dependent upon operation, 14; unheard from, 42.

The patients who responded to the requests for a personal or written communication were operated upon for the following conditions: 70 for disease of the tubes and ovaries; 33 for myoma uteri; 12 for irreplaceable retroflexio uteri; 1 for artificial atresia of the vagina.

In the review of the cases especial attention was directed to ascertaining the influence of castration upon:

1. Menstruation, vicarious bleeding and leucorrhœa.
2. Molimina menstrualia.
3. The sexual life of the woman.
4. The changes in the genital organs.
5. The general constitutional changes.
6. The nervous and psychical changes.
7. The therapeutic effect.

The Influence of Castration upon Menstruation. Concerning this question one not infrequently finds cropping out in the general medical literature, of even the present day, the statement that the removal of the ovaries is by no means certain to be followed by the cessation of menstruation. Pfister's review, along with that of many other well-authenticated reports which he has collected in a tabulated form, demonstrates unmistakably the truth of Hegar's original statement that, as a rule, the removal of the ovaries induces an absolute and permanent cessation of the catamenial flow.

CESSATION OF MENSTRUATION AFTER CASTRATION.

Statistics from	No. of observations	Material from	Menses ceased.	Menses continued.
Strühl	33	Bischoff-Fehling	90.9 p. ct.	9.1 p. ct.
Schmalfluss	32	Hegar (neurotic cases)	90.0 "	10.0 "
Widow	37	Hegar (fibroma uteri)	97.3 "	2.7 "
Gläveke	41	Kiel Gynecol. Clinic and from the reports of Hegar, Schmalfluss, Tissier	86.0 "	14.0 "
Hermes	64	Halle clinic	78.4 "	21.6 "
Liesau	271	Hegar's entire statistics	75.6 "	24.4 "
Pfister	116	Kuhne's cases	94.8 "	5.2 "

From this table it is evident that a varying percentage of patients do not cease to menstruate after castration, which is in apparent opposition to Hegar's statement. Whether the extirpation of the ovaries has been complete or only partial in such cases is, of course, the question. According to my observation, in cases where there is no doubt as to the complete removal of the ovaries, I am convinced that Hegar's rule is well-nigh, if not quite, infallible. Pfister takes the same view.

Among the various theories concerning the relationship of ovulation to menstruation, Pfister accepts that of Pflüger, who maintained that ovulation is an independent function and is not necessarily synchronous with menstruation.

According to this theory, therefore, ovulation is a more or less continuous process. Through the gradual enlargement of the Graafian follicles the fine nerve-endings within the ovary are irritated, and from this source a reflex action upon the spinal centre governing menstruation is exercised which finally generates, through a cumulative action an impulse of sufficient strength to induce the menstrual congestion and flux.

If there is a mature follicle present at the time of this wave-like rise of pressure in the circulatory apparatus of the ovary it ruptures, and thus ovulation and menstruation become synchronous; otherwise the menstrual wave subsides without further influence upon the ovary. According to this theory ovulation may skip the menstrual period and occur in the interim.

The periodicity of menstruation is dependent upon the formation of the menstrual decidua, which requires, as a rule, four weeks for its completion. The wave-like rise in blood-pressure and the acceleration of other vital functions represent the time when the decidua is being formed; the abrupt fall in this wave, its casting off.

Although this theory at first sight appears very plausible, I do not think it is borne out by scientific observations. In the lower animals the rutting season and ovulation are as synchronous as the movements of the well-regulated driving mechanism of a clock to the striking apparatus, and, from the stand-point of comparative physiology, I see no reason for a radical departure from this rule in the human being. This is merely an incidental remark, however, upon this much-discussed question of synchronism of ovulation and menstruation, and it does not bear directly upon the subject in hand, for Pfister unreservedly ascribes the active initiating force of menstruation to the ovary.

With this fixed opinion Pfister at once proceeds to an explanation of the persistence of menstruation, after castration, by claiming that when this is the case more or less of one or both ovaries have been left behind. Thus in eight of his cases portions of the ovaries were undoubtedly left adherent to the intestines and to the broad ligament, for the complete removal of all ovarian tissue was impossible on account of dense adhesions.

In other instances a smaller amount of ovarian tissue was left, and yet menstruation, according to Pfister, continued uninterrupted until the follicle situated within the remains had been consumed in the natural process of ovulation and obliteration.

In one case menstruation ceased for six months after operation, when it again returned with its usual regularity. In explanation of this phenomenon, Pfister says the ovarian tissue probably contained only primitive or partially developed follicles, and that the six months' interim represented the time required for these follicles to grow sufficiently to set up the requisite reflex irritation to produce menstruation. Of course this explanation is merely theoretical and can be offset by other hypotheses quite as plausible.

In two cases of uterus unicornis menstruation continued notwithstanding the removal of the one ovary; but this apparent paradox is attributable, as Pfister thinks, to the failure to find the ovary of the atrophic side, which, however, was most likely present.

With this exception all the other cases in Pfister's tables ceased to menstruate immediately after the ablation of the ovaries. In twelve cases vicarious bleeding in various parts of the body occurred, twice from the intestines and ten times as an irregular epistaxis.

Concerning the influence of castration upon the leucorrhœal flow, there appears to be no definite rule. In general there is little or no change noted at first, but, as stated by Gläveke, coincident with the retrogressive changes in the genitalia this symptom gradually subsides. In cases of myoma uteri, where ovariectomy was done for its palliative effect, Pfister found distinct improvement in the leucorrhœal discharge in 80 per cent. of cases, and an absolute cure in 64 per cent. This observation is an extremely interesting one, as it would appear to point to the fact that leucorrhœa is to a certain extent due to increased blood-supply, no doubt also to hypertrophy of the endometrium, both of which conditions are usually found in myoma uteri. A decrease of blood-supply naturally causes an atrophy of the mucosa, hence the diminution in the leucorrhœal discharge. These remarks are suggested on account of recent observations by the reviewer upon the blood-supply of these tumors. At best myoma are poorly vascularized compared with the surrounding musculature, and their disappearance is no doubt due to a decrease in the already minimum supply.

MOLIMINA MENSTRUALIA. Under this term Pfister considers all of the constitutional symptoms which occur periodically in the absence of menstruation.

His explanation of these phenomena is grounded upon Pflüger's theory of the independence of the menstrual function so far as the active preparation of the decidua menstrualis is concerned. If I take him rightly, he believes the final menstrual act, the discharge of blood from the endometrium, alone depends upon the irritation emanating from the ovary and acting reflexly through its cumulative action in the spinal centres.

Believing that the development of the decidua menstrualis is an entirely independent process, he thinks it only ceases through the progressive atrophy of the uterus and endometrium, and that only when this retrogressive change is completed does the menstrual molimen cease.

The application which Pfister makes at this point of Pflüger's theory, in explanation of the menstrual molimen, is by no means satisfactory. The prompt and absolute cessation of menstruation in the vast majority of cases, subsequent to ovariectomy, is directly due, according to my opinion, to the removal of the ovaries.

The relationship of cause and effect is too easily traced, it seems to me, to be overlooked. My own observations made in the line of research in the vascular supply of the ovary lead me to a positive belief in the dominating influence of the ovary over the menstrual function. I may be wrong, but nevertheless I feel convinced that the simile of the dependence of the striking apparatus upon the driving mechanism of the clock, alluded to on a preceding page, is analogous to the dependence of menstruation upon the active functionation of the ovary; remove the latter and not only do the outward symptoms of menstruation cease, but the decidua menstrualis is no longer formed. In other words, destroy the driving apparatus of the clock and the striking apparatus no longer acts. This subject has, however, been a bone of contention ever since Pflüger announced his theory several decades ago, and until we have more convincing anatomical and physiological evidence in favor of one side or the other, will no doubt remain in dispute.

Since the main points of interest in this paper are the practical results we can quite properly drop the theoretical side.

The menstrual molimina enumerated by Pfister are the recurrent vascular and cardiac disturbances (palpitation, etc.), nervous symptoms, such as flashes of heat and cold, vertigo, meteorism, backache, pain in the abdomen, drawing sensations on both sides of the uterus, pain from the abdomen deflected into other organs and congestion of the pelvic organs combined with sensations of fullness.

Symptoms of this nature were complained of in 30 per cent. of cases. As a rule, the climacteric symptoms were more severe in the first month, gradually subsiding thereafter until they finally disappeared. Final disappearance of the disagreeable sensation varied in time from a few months to two years.

The Influence of Castration upon the Sexual Function. The late Professor Goodell has said that the determination of the actual effects of ovariectomy upon the sexual relations was likely to remain more or less in doubt, on account of the reluctance of patients to express their true feelings upon this subject. With the accumulation of evidence from various sources we have, notwithstanding this difficulty, gradually arrived

at a better defined opinion upon this subject, but still more extensive statistics are desirable before a final conclusion can be reached.

Pfister, therefore, has made no little addition to this subject by recording accurate reports concerning the effects of castration in ninety-nine cases.

In considering this side of woman's nature we must not lose sight of the fact that the sexual sensibilities are, as a rule, less acute in normal women than in men. To find a man devoid of sexual passion is such an exception as to be considered a pathological condition; whereas in women of perfect health and otherwise normal, this attribute may be deficient or absent.

Concerning this point Prof. v. Rosthorn, of Prague, made the startling statement to me, in a conversation upon this subject, that of all the women who consulted him at least 70 per cent., he felt convinced, had been indifferent to the sexual approaches of their husbands or lovers, even while they were yet in perfect health. In view of such statements it at once becomes evident that the post-operative side of this question cannot be determined definitely without control-records of the sexual proclivities of the patients before they became ill.

Pfister, like Pflüger, believes the impulse to sexual intercourse is referable to the ovary, and that the erotic sensations experienced during the orgasm emanate from the clitoris.

According to this theory the removal of the ovaries would naturally extinguish sexual desire, but such is not the case as shown by Pfister. From reliable reports received from 99 women, the following is the result: In 19 cases the sexual desire remained the same as before operation; in 24 it was somewhat diminished; in 35 it was extinguished, and in 21 it had never been present. An erotic sensation, during coitus, of the same intensity as before operation, was experienced in 18 cases; in 20 it was somewhat diminished, and in 40 it was absent.

The following statistical table, taken from the reports of other writers, shows somewhat varying results:

SEXUAL PROCLIVITIES.

After operation.	Sexual desire.			Erotic sensations during coitus.		
	Gläveke.	Liesau	Pfister.	Gläveke.	Liesau.	Pfister.
Normal . . .	6-22 p. ct.	3-17 p. ct.	19-26 p. ct.	8-31 p. ct.	6-40 p. ct.	18 22 6 p. c.
Weaker . . .	10-37 "	1-5 "	24-30 "	10-38 "	4-26 "	20-24 4 "
Absent . . .	11-41 "	13-76 "	35-43 "	8-31 "	5-34 "	40-52 "

The wide variation in percentage is no doubt due to the difference in the number of cases observed by each writer, and also to the many obstacles in the way of securing accurate data on account of the reluc-

tance of patients to talk even to their physician about such matters. A tactful interrogator, however, by directing his questions delicately and along the proper line, may often secure quite complete information as to this point.

In view of these difficulties we are naturally forced to accept all of these statistics with some reserve. While they show a considerable percentage of cases in which the sexual passion is either not abated or only slightly diminished, there is still a large proportion in which it is absolutely abrogated.

Upon this point I may say that not only is it entirely abrogated in some instances, but occasionally, through atrophic changes in the vagina, sexual intercourse becomes exquisitely painful or even impossible. In one instance which came under my observation this developed to an extreme degree in a woman previously neurotic. Indeed, the dyspareunia finally became so great as to lead to a discontinuance of all attempts at intercourse, and the final abandonment of the woman by her husband.

As an explanation for the persistence of the sexual proclivity in some women after operation and its abrogation in others, Pfister resorts to a most ingenious theory. He refers to Beimler's experimental castration of female dogs which had borne one or more litters of pups, and of young animals which had not yet become pregnant. In the first series the rutting period recurred subsequent to castration, whereas in the second it was never inaugurated.

Brodnitz, on applying this theory to women who had been subjected to ovariectomy, was convinced of its correctness.

In this connection Pfister quotes Keppler's well-known case of a prostitute who, after plying her vocation for some time, underwent ovariectomy. The course of her life was the same subsequent to her operation, the approaches of her accepted lover being attended with quite as much pleasure as before.

Pfister believes there is a so-called *libido sexualis*, which is situated within the spinal centre and is dependent upon the ovaries, but in addition to this ecstatic the nervous excitation incident to the orgasm in animals and women accustomed to sexual congress makes such a marked impression upon the cerebral or psychical centres as to establish a *libido centralis*.

In young female animals or women upon whom ovariectomy is performed before this *libido centralis* is awakened through contact with the male, the primary *libido sexualis* is completely abrogated; consequently, the secondary centre is never established, whereas in older animals, notwithstanding this change, the *libido centralis* is of sufficient strength to furnish a psychical pleasure. In other words, I understand the *libido centralis* from Pfister's description to be a sort of auto-hypnotism or sexual

suggestion produced by the repetition of the sexual act previous to the castration.

From a review of the post-operative histories of a considerable number of patients in the Johns Hopkins Hospital, I feel very much inclined toward this theoretical explanation of Pfister, Beimler, and others. Whether it holds as an absolute rule in all cases, I am unable to say. In one instance under my observation the case of Kepler, above referred to, was duplicated. The patient was a variety actress of no little prominence, but, like many of her ilk, had been for a number of years the subject of gonorrhœa which had finally culminated in double pyosalpinx and severe pelvic peritonitis, requiring double salpingo-oöphorectomy. On returning to Baltimore some two or three years after her discharge, she reported by request at the hospital. Her health was entirely restored and the sexual passion, which had previously been abolished through constant suffering, had returned with well-nigh double force after her recovery.

Pfister's conclusion upon this point corroborates the statements of a number of other writers. Hegar says, "The sexual desire frequently persists;" Tissier, "Most frequently this condition remains as of old;" Fehling, "The sexual desire is sometimes decreased and sometimes remains the same;" Péan, "Woman retains the same desire and the same sensations." Bircher saw the sexual desire disappear in the minority of his cases, but in the majority it was only weakened.

These general statements are misleading in that they lead us to believe that women of all ages and temperaments are influenced alike. Each series of cases should be analyzed with regard to the age of the patient at the time of operation, for in this way only can we arrive at any definite idea as to the relationship between the so-called libido sexualis and libido centralis.

An analysis by Pfister of his cases shows the following divisions according to age: Under twenty-six years, 6 patients; between twenty-five and forty years, 49 patients; over forty years, 23 patients.

Of the patients under twenty-six years, four were single and absolutely denied having had sexual intercourse. Subsequent to operation they lost all sexual desire. The remaining two, who were married, observed a decrease, but not an abolition of sexual desire.

Of the 49 patients between twenty-five and forty years, the sexual proclivities remained the same in 20 cases, were diminished in 15, and entirely abrogated in 14. In the last group of 23 cases over forty years, 1 remained the same, 7 showed decrease, while in 15 all passion was lost.

From this comparison of cases it is seen at once that the sexual attributes are most persistent in middle-aged women in whom sexual habits have become established. Women approaching the menopause naturally

experience a decrease in this respect; consequently it is not just to attribute the same changes after castration at this period entirely to the effects of the operation.

Pfister has studied the condition of the clitoris in a considerable number of cases, to see whether it is possible to attribute the loss of sexual sensations to atrophic changes in this organ. The absence of sufficient trustworthy data, however, leaves this point undetermined.

Influence of Castration upon the Sexual Organs. In the natural menopause the Graafian follicles gradually disappear and are replaced by connective tissue, and coincident with this process there is a progressive atrophy of the genital organs. Through castration a premature climacterium is inaugurated, as first described by Hegar.

Gläveke, through periodical examinations of nineteen patients, was able to follow accurately the retrogressive changes. He found in all cases marked atrophy and narrowing of the vagina, beginning first with a hyperæmia and hypersecretion, followed by a general shrinking of the tissue and the formation of characteristic red spots, which at last give way to a general atrophy. During these retrogressive changes the portio vaginalis became narrower and smaller, while the uterus underwent marked decrease in size.

Pfister's observations are similar to those of Gläveke upon this point. Concerning the changes in the vagina, he thinks they are less frequently present, at least he has not noted their occurrence with the regularity described by Gläveke.

With regard to changes in the breasts, Kehrer has found that atrophic changes occur in the same way as in the uterus. According to Pfister's observations atrophy of these organs took place in 50 per cent. of all cases examined.

Influence of Castration upon the General Constitution. In the lay mind, and even among some physicians, there is an impression that ovariectomy induces most bizarre changes in the female characteristics, consisting in remarkable transformations in the voice, in the general figure and size of the individual, in the growth of hair, and, finally, in the disposition.

To the specialist, of even limited experience, these ideas are known to be erroneous. The predominating tendency, noted in these cases, is to an accumulation of fat, the patient occasionally becoming quite stout.

In Pfister's report forty cases increased moderately in weight, while twenty became excessively stout, making in all a 52 per cent. tendency to obesity. In 30 per cent. the weight remained the same, while in 18 per cent. there was an actual decrease. With the exception of this inclination to an increase in weight, young women, in whom the artificial menopause is induced, take on little or none of the other matronly

appearances of women entering the natural climacterium. Even the addition of fat does not give the patient the ungainly appearance of older women, for it follows the same general plan of distribution as obtains in other youthful individuals who tend to become stout. Instead of an impairment in personal appearance, patients relieved of suffering often improve to a remarkable extent.

Their general appearance is fresher, their spirits more buoyant and youthful, the complexion is clearer, the superficial pigmentations become less noticeable, the hair of the head grows more luxuriously, chloasmata frequently disappear, and the general color is of a healthier appearance. The growth of hair upon the cheeks, upper lip, and chin, either in the form of isolated bristles or as a beard, does not occur, as has occasionally been stated. So far as the changes are concerned in women who are subjected to ovariectomy near the climacterium, the symptoms are identical with those of the natural event.

Influence of Castration upon the Nervous and Psychical Systems. The more this subject is studied by alienists, neurologists, and gynecologists, the more the evidence goes to prove that the removal of the ovaries does not exercise an ulterior effect upon the psychical system to the extent of producing insanity.

The radical retrogressive changes in the anatomy and function of the generative organs undoubtedly acts reflexly upon the nervous system and gives rise to an exaggerated train of climacteric symptoms. These symptoms may, to a certain extent, be considered normal, for very few women pass through the change of life without them. It is only when they become excessive that they may be termed pathological. The nervous disturbances incident to the artificially induced menopause, especially in young women, are often of a much more turbulent nature than in the natural climacterium.

Neuralgic headache of varying severity, according to Pfister, is one of the most frequent symptoms, occurring in 62 out of 99 cases. In some cases it had existed before, but in the majority it arose after operation. Concerning the general disposition of the patients, Pfister has found in 50 per cent. irritability, capriciousness and changeableness at some period after operation.

Twelve women stated that they were more irritable subsequent to operation; but in only two cases had the disposition become markedly worse. In three cases pronounced melancholia, noted before operation, disappeared subsequent to it. One case developed melancholia three months after operation, which necessitated her detention in an insane asylum thirteen months for treatment. Twenty-six women were unchanged, while thirty-four reported a marked improvement in spirits and disposition.

Pfister finds himself in accord with the opinion of Brodnitz, Péan, Gläveke, and Schmalfuss concerning the effects upon the memory. Statements from 108 women show that in 74 there was a loss of memory either of past or everyday events, while in 34 no changes in this respect were noted.

Therapeutic Effect. In approaching this topic Pfister waxes eloquent, claiming that the most satisfactory therapeutic effect has been noted in a great majority of cases. According to his statement, a large number were greatly benefited, and in not a few cases an ideal therapeutic result was obtained.

He finds that the largest number of patients only come to operation after long years of suffering, and, as a result of the beneficial effects of their treatment, a well-nigh unbearable condition has been replaced by a condition free or greatly relieved of discomforts, giving the patient a new lease of life.

All of the patients, at the time of operation were, to a varying extent, unable to carry out their daily vocations, but, with the exception of four cases, have subsequently been able to resume work.

The majority of patients were entirely satisfied with the operation, while many expressed the greatest joy over their full restoration to health.

The statistical results were as follows: In 87 cases the complaints arising from the diseased condition for which operation was performed were completely, and in 18 cases partially, relieved. In 6 cases the results were unsatisfactory; of these, 4 suffered from hysteria, 1 from chronic intestinal catarrh, and in 1 case the operation was not complete. Only 4 cases remained the same or in a worse condition. Absolutely no beneficial results were obtained through operation in the cure of hysteria or hystero-epilepsy. While attendant physical ailments were relieved, the nervous disturbances remained unabated.

Concerning post-operative hernia, Pfister says it occurred in nineteen cases. According to the statistics of the best American operators, I should say this is an excessive percentage, and yet one must not lose sight of the fact that many of these cases were no doubt operated upon some years ago, before the technique of closing the abdominal wound had been developed to its present perfection.

The article of Pfister has been reviewed rather fully, because it contains many valuable facts. That such a small series of cases can settle any of the questions which he has considered, is not possible, and yet his contribution will serve as a valuable addition to this subject. The facts which he brings out concerning the effects of castration upon young women are full of interest and merit close attention, for they only emphasize the impression which has been much more generally accepted

of late, that ovariectomy in unmarried or young women is only to be performed for the relief of very grave pathological conditions.

The majority of operations of ovariectomy in young women is for gonorrhœal salpingitis, a condition which induces much suffering, but does not, as a rule, endanger life. While conservatism may be carried too far, I am convinced from cases under my observation, that even moderately severe gonorrhœal inflammation of the tubes may undergo resolution. In these cases, just as in male individuals, sterility is very likely to be a sequel, and more or less severe dysmenorrhœa may be induced through perioöphoritic deposits; a waiting policy is preferable, nevertheless, if it offers a hope of recovery, to salpingo-oöphorectomy with immediate relief of the local pain and discomforts but followed by a train of more or less severe nervous disturbances. Concerning this question, I recall the personal statement of Professor Freund, to the effect that he now adopts a tentative plan of treatment even in gonorrhœal pyosalpinx, believing that in a certain proportion of cases the patient is restored at least to a comfortable condition. If after a year no improvement is noted, he resorts to operation.

This may appear like radical conservatism, and I confess to a feeling that at least drainage of the pus tubes through the vagina would be preferable to this course. From the latter method of treating these cases, not infrequently the most satisfactory relief of symptoms is effected.

It is very gratifying to see the general tendency in favor of conservatism which has developed during the last year or so.

SHALL THE HEALTHY OVARY BE REMOVED IN CASES OF HYSTERO-MYOMECTOMY?

This question, as Abel¹ states, has been under a running discussion from the first inauguration of hystero-myomectomy until the present time, and varied have been the answers.

Schröder, the first operator sufficiently bold to drop the cervical stump after hystero-myomectomy, advised the retention of the adnexæ, which was diametrically opposite to the views of his contemporary, Hegar. Kaltenbach likewise held it to be of decidedly questionable value to leave the ovaries, while Péan, on account of a fatal result from a post-operative hæmatocele, advised their removal.

According to Fritsch's experience one can leave the ovaries in young persons without anxiety; and he states that he has never seen the onset of marked climacteric symptoms in such cases.

Brennecke has also followed the latter policy, because no untoward results have followed its adoption.

¹ Archiv für Gynäkologie, vol. lvii. p. 290.

Gläveke states that the physiological activity of the ovary continues uninterrupted in these cases until the advent of the natural menopause ; consequently all the ill effects of this period, when prematurely induced by castration, are greatly diminished. Hegar, on the contrary, says it is not conceivable that the presence of the ovaries, after the removal of the uterus, can give rise to good results ; on the contrary, the association of functioning ovaries with natural or artificial defects of the uterus may lead to disturbances. Leopold supports Gläveke's views as to the active persistence of the ovarian function after the removal of the uterus, and says the *adnexæ*, unless diseased, should not be removed in hysteromyomectomy, for their retention either prevents, or at least greatly alleviates, the disagreeable symptoms of the artificial menopause.

Howitz does not remove the ovaries, because he has never seen any ill results follow their retention ; Knowsley Thornton advises against their removal on account of the deleterious influence exercised upon the sexual relations, while Hamilton believes that their presence exercises a beneficial influence in decreasing post-operative nervous disturbances.

Opposite views to those of Gläveke are held by Brennecke concerning the histological changes occurring in the ovary subsequent to the removal of the uterus, for he says they undergo moderately rapid atrophy and a cessation of function. Although Abel, from his study of sixty-five cases subsequent to hysteromyomectomy, cannot fully agree with Brennecke's statement, he nevertheless holds similar views as to the ultimate results.

The atrophy of the uterus following ovariectomy is now a well-established fact, and Abel's examinations of patients, subsequent to the removal of the uterus without the ovaries, convinces him that there is likewise more or less atrophy of the latter subsequent to the operation, which induces, before the natural climacteric period, a complete cessation of function. His proofs of these retrogressive changes are both physiological and anatomical.

The symptoms and changes occurring after the total extirpation of the uterus, without the removal of the ovaries, simulate those of the natural, rather than those of the artificial menopause induced by castration. In the latter condition the symptoms are abrupt and quite stormy in their development, whereas in the former their onset is quite gradual. The *molimina menstrualia* in general caused little discomfort, occurring in only 50 per cent. of Abel's cases. Two patients who suffered most severely from these symptoms had had densely adherent appendages.

A peculiarity noted by Abel is the enlargement of the ovaries, soon after the operation, which is especially marked when only one ovary has been left. This hypertrophy persists for a variable time, and in one instance it was observed two and a half years after operation. Reaching

its maximum there is then a marked diminution in size. In cases which had passed three years since the operation the ovaries were not larger than hazlenuts, while after four years they were no longer palpable.

Somewhat opposed to Abel's views and rather favoring Gläveke's are the observations of Grammatikati on the ovary of a woman who had died three years after hysterectomy. In this instance fully developed corpora lutea without any trace of atrophy of the ovary were noted. Similar experimental results were also obtained in rabbits. From Abel's clinical study he cannot sustain Gläveke's statement as to the persistence of ovulation for a long period. According to him, had Gläveke followed the histories of his cases longer he would have arrived at different conclusions, for in not a single case, observed by Abel longer than three years, did atrophy of the genital organs and symptoms of the menopause fail to appear.

After a very careful tabulated review of his cases Abel concludes that there is always a secondary atrophy—in older women already approaching the menopause it is much more rapid than in younger individuals. This conclusion naturally answers the question of whether we shall leave the ovaries in cases of hysteromyomectomy in the affirmative, for, according to Abel's observations, this gradual passage of the patient into the climacterium is attended by far less disagreeable symptoms than when it is abruptly induced by castration.

As a concluding suggestion, Abel advises that the stump in hysteromyomectomy shall be so formed as to preserve part of the mucosa, for by this means he believes the patient may be shielded still further from the ill effects of the early induced climacterium. In this opinion he agrees with Engström, who says a certain depressing influence is exercised upon the majority of women by the cessation of menstruation before the natural menopause; and for this reason even a misshapen and non-functionating uterus is better than none at all.

My confidence in Abel's conclusions are induced, first, by his careful review, upon the face of which there is every evidence of thoroughness, and, second, by my personal knowledge of the man whose reputation in Leipzig is that of a most painstaking and accurate worker. His suggestions, therefore, would influence me very strongly even though I held opposite views, but in this instance they are similar, at least so far as the propriety of leaving the ovaries is concerned. There can be very little danger in following his suggestion as to leaving a portion of the mucosa in cases of hysteromyomectomy, for while Jacobs has reported a subsequent carcinomatous invasion of the stumps in two cases, and very strongly advises complete hysterectomy on this account, from my own clinical observations and the review of the literature of this subject, I am certain his fears are unfounded.

The absolute closure of the stump from above should, however, be the *sine qua non* of the operation, for the well-authenticated instances of conception occurring in the most remarkable ways and under the most unheard-of pathological conditions, render this precaution necessary. While pregnancy in such a stump would be very improbable, and should it occur would certainly be followed sooner or later by degeneration of the ovum and abortion, nevertheless complications might arise in its development which would become dangerous.

Through the partial preservation of the mucosa it would appear quite probable that the correlation of menstruation with the active functionation of the ovary might be greatly prolonged, even to the natural menopause. Such suggestions as these, while at first sight promising, can only be settled by careful and prolonged observations, but so long as they appear possible of development without injury to the patient they should be followed.

OVARIAN EXTRACT (OVARINE) IN THE TREATMENT OF THE SYMPTOMS OCCURRING DURING THE ARTIFICIAL AND NATURAL MENOPAUSE.

During the last few years organo-therapy has received considerable attention, but as yet the results obtained in the alleviation of the symptoms incident to an artificially induced or natural menopause, from the exhibition of the extract of the ovary, do not justify the optimistic predictions of even one year ago. Since the ill effects of castration in young women are undoubted, the use of ovarine was naturally resorted to by many gynecologists in the hope of offsetting these disagreeable sequelæ. Like all new remedies, the most laudatory notices have appeared from time to time in the medical periodicals concerning its use, but when these hasty reports are closely examined, the evidence from which sweeping conclusions have been based is found to be of the most meagre sort.

As yet the strongest recommendations in favor of ovarine have come from the French writers. Being assured from a general review of the literature of the past year that no fast and unalterable advice can as yet be offered upon this subject, the purpose of this review will be amply served in giving the epitomized reports of two French writers. The first, P. Dalché,¹ has employed the ovarian extract in different gynecological diseases, and arrives at the conclusion that it is of the most service in the difficulties of the natural and artificially induced menopause. In opposition to Jacobs' observation, that the value of this remedy in the relief of climacteric symptoms decreases with the age of the patient,

¹ De l'Opothérapie Ovarienne, Bull. Générale de Thérapeut., January, 1898.

Dalché says he has seen a patient of twenty-three years very much relieved by it. In chlorosis he has also obtained very satisfactory results, one young woman showing very rapid improvement as indicated by the increase in weight, the return of her menstrual flow and the improvement in appetite.

This writer believes that an antagonistic action exists between the thyroid gland and the ovary. In Basedow's disease there is a frequent cessation of the menses, whereas in myxœdema metrorrhagia is of frequent occurrence and may be successfully combated by the use of thyroïdine. On the other hand, he has seen Basedow's disease greatly improved by ovarine. In a few cases of amenorrhœa and dysmenorrhœa good results have been obtained. For the relief of melancholia, neurasthenia, hysteria, and other nervous disturbances it is also advised. No evil results have been noted from its administration. Upon the face of this report Dalché's conclusions appear to have been hastily drawn, and by far too many diseases have been included in the list of those which may be benefited.

From the results of F. Jaylé's¹ careful observations upon the therapeutic effects of the same remedy, one must further conclude that Dalché's sweeping statements in favor of ovarine must be taken with a grain of salt.

Jaylé has observed the therapeutic effect in nineteen cases of artificially induced menopause and in three cases of natural menopause. His cases have been recorded with care, and from his detailed observations I think his conclusions may be accepted with considerable assurance of their correctness. He says :

1. The employment of ovarine is harmless.
2. The treatment is of value in the artificial menopause, and appears to be superior to all other remedies in the relief of the congestive symptoms incident to this period. Upon the nervous symptoms it has little or no effect, and when relief is noted it is attributable to mental suggestion rather than to a direct therapeutic influence.
3. In the natural menopause beneficial effects are noted less frequently, which may be due, according to Jaylé, to the administration of too small doses.
4. In beginning the ovarine treatment small doses, 0.1 to 0.5 grammes daily, should be administered. In case no effect is noted the doses may be increased. The quality of the extract should always be definitely ascertained.
5. In general the treatment must be continued for a long time, and as the patient becomes accustomed to the preparation, the dose should be increased.

¹ Paris, *Revue de Gyn. et de Chir. Abdom.*, 1898, No. 2.

6. Sometimes ovarine proves absolutely valueless without any explainable reason.

This brief article upon the subject demonstrates beyond doubt that while this remedy may be of benefit in some cases, its scope is limited, and the results from its administration are more or less problematical.

In view, however, of the fact that it is absolutely harmless, it should be extensively tried but its effects should be noted under a coldly critical eye, rather than by the therapeutic enthusiast who is ready to accept every new remedy and after the most meagre experience with it laud it to the skies.

So far as my personal experience goes, I have seen a few cases where it appeared to do good, but in many other instances absolutely no beneficial effect was noted.

TRANSPLANTATION OF THE OVARIES.

One of the most interesting scientific papers of the last few years is that of Emil Knauer¹ concerning the experimental transplantation of the ovaries of rabbits, which gave very surprising results in that the experiments were generally successful, and the engrafted ovaries continued their active functionation.

Grigorieff repeated Knauer's experiments and obtained like results. The summary of the chief points in their work is as follows:

1. Ovaries transplanted from one rabbit to another may become nourished and continue active functionation. The proof of this statement is that both Knauer and Grigorieff had animals to become impregnated after the operation.

2. The transplanted ovaries remain normal for a long time and continue to functionate.

Histological examination of one ovary six months after the experimental operation proved it to be normal, while a control laparotomy in the same animal thirteen months later showed a like condition.

Through the suggestion of Professor Munk, of the Berlin Physiological Institute, Arendt,² one of his students, repeated the experiments to ascertain if an error had not crept into Knauer and Grigorieff's work. As a result of these experiments Arendt challenges the work of the first investigator by claiming that the technique of the castrations was at fault. According to Knauer's statement, the ovaries were lifted out of their normal position with the fingers, were then ligated off and excised. This procedure, according to Arendt, is open to objection in that it is impossible to remove the ovaries of rabbits in this way

¹ *Centralblatt für Gynäkologie*, 1896, No. 20.

² *Ibid.*, 1898, No. 41.

without injuring them, and the suspicion arises, therefore, as to whether or not portions of the ovary have not been left behind.

Arendt transplanted the ovary eleven times to another part of the broad ligament of the same animal, sometimes transposing the ovaries of the two sides, and in two instances the ovaries of two rabbits were transplanted to other animals, and *vice versa*. Twice an exchange of the ovaries of rabbits was made for those of cats. Notwithstanding the greatest precaution observed in the operation, atrophy of the entire genital apparatus invariably occurred in a comparatively short time. Three times the atrophic remains of the ovaries were found, which, according to Arendt, proves that they may become engrafted to these unusual areas, but after a short time (six to twelve weeks) undergo simultaneous atrophy with the uterus and tubes.

While this is rather strong evidence against the accuracy of Knauer and Grigorieff's observations, it can hardly be said to disprove them. Knauer, in a reply to Arendt, very vigorously supports his first statements and repels the imputation of carelessness in his technique. In addition to the experimental animal, in which a normal ovary was found thirteen months after operation, he says he has since examined another, two years after operation, with a similar result. According to Knauer's reply, it would appear that it is Arendt's faulty methods of operating, instead of his own, which have given rise to the contradictory statements. Like all other scientific disputes, this one will no doubt have to be settled by a third investigator.

In view of the splendid vascularization of the ovary with both blood and lymph-vessels, it would not appear, as stated by Arendt, utterly opposed to physiological laws for the circulation to become re-established and nutrition to be thus maintained in the transplanted organs.

In this connection the interesting experiments of Harrison, of the Johns Hopkins University, are recalled, in which the grafting of the tail end of one tadpole upon the head end of another was followed by complete union, and still more astonishing, this patched up individual developed into a frog, whose fore-parts corresponded to one species and its hind-parts to another.

The fact is also certainly established that even small bits of ovaries left after the most mutilating operations may continue to functionate, and the question naturally arises why cannot the same course of events occur when the ovary is transplanted under the greatest care and surgical precautions. In view of these facts my inclinations are toward Knauer's side of the controversy.

HISTOGENESIS OF DERMOID CYSTS AND TERATOMATA OF THE OVARY.

There is, perhaps, no subject in gynecological pathology which has been more discussed, and until quite recently more completely veiled in mystery, than the etiology of dermoid cysts.

The peculiarities of these cysts mark them as unique pathological creations which stand alone in their classification, without any relationship to other tumors, for their deviation from the normal is so far marked that they partake of not one but of all of the primary embryological layers. Although the derivatives of the ectodermal layer are so frequently present as to give rise to the term dermoid cyst, the tissues and organs arising from the mesoderm and entoderm are by no means excluded; in fact, they are found in the majority of specimens.

The theory which has ascribed these tumors to a nipping off or inclusion of the ectodermal layer in the early growth of the embryo has certainly never been satisfactorily proved, and many well-versed pathologists have held it only as a tentative hypothesis which must be further substantiated or must give way to a stronger theory.

This distrust has been very greatly strengthened by the advances in embryological investigations, and so far as my own study of the origin of the generative organs is concerned I have become more and more prejudiced against this theory. The vital objection to it is that ovarian dermoid cysts do not conform to the type seen in the superficial parts of the body, where they are undoubtedly purely of ectodermic origin, for they contain only those tissues characteristic of this layer. At first the analogy between these two types appeared to be established, but as one investigator after another reported structures in the ovarian dermoid arising from the mesoderm and entoderm, the theory was seen to be quite vulnerable.

To those who already distrust or are entire dissenters from His' inclusion theory, a recent research by Kroemer¹ comes as a very convincing argument against it. While this paper may not have established the ovulogenous theory of development of dermoid cysts, I think it can be said to have dealt a very telling, if not a fatal blow to the older inclusion theory. This investigator has pursued the typical plodding methods of the German, and in his endeavor to give us the complete data from which his conclusions have been drawn his paper has been encumbered with some rather tedious details.

Apropos of this remark a personal letter of Billroth to his pupil v. Rosthorn, with regard to a paper which the latter had written, is

¹ Archiv. für Gynäk., vol. li. p. 322.

recalled. After congratulating the writer upon the general results of his work the distinguished surgeon offers the friendly criticism, due to the student from his preceptor, to leave out in his future publications the long and tedious histories of cases, for, as he said, no one will read them. Above all else the practical man, and even the busy scientific man, demands results, for he knows full well that no original research can be successfully criticised without personally reworking its details or attacking the subject from a new stand-point.

Kroemer has redeemed himself, however, by giving us a splendidly digested summary of his work which contains all the essential points. While some of his descriptions appear almost hypothetical, one must be convinced of the thoroughness of his work both through its painstaking details and because it has had the personal supervision of Prof. Pfannenstiel, of Breslau, who has shown especially strong research ability.

Kroemer calls attention to the fact that while all dermoid cysts have the same characteristics, the deviations from a standard type, if it were possible to assume such a type, are so many and extensive as to give each specimen a peculiar individuality of its own. These unique specimens are neither simple tumors nor cysts, but consist of a purely cystic portion and of embryological elements, either of which may grow in excess of the other. Thus to the changing form in the cystic portion, and not to the growth of the dermoid itself, may be ascribed the variability in the general appearance of the tumor. According to Kroemer's opinion the cystic portion is of follicular, the dermoid of ovulogenous origin.

It seems to me that Kroemer has furnished very strong argument in favor of this theory and if all his observations can be substantiated there can no longer be any doubt as to its correctness. An observation in line with this theory had already been made by Lee in one case where the diminutive dermoid maintained the same relationship to the follicular cavity as that of the ovum to the follicle. Steinlin has also described a case in which a small dermoid remained as an intra-follicular growth connected by a delicate vascularized pedicle with the follicle wall. A similar observation has been made by Sutton in his examination of a dermoid cyst in the ovary of a horse. Kroemer has likewise been able to make out a similar relationship of the dermoid to the follicle in two cases. Another extremely interesting observation of great etiological moment is the finding of an epidermal covering of the base of the transforming ovum lying in contact with the follicle wall, while immediately adjacent normal lutein cell tissue was found.

From these observations it would appear that the epidermal lining of dermoid cysts is merely a transplantation from the ectoderm of the ovum,

and this truly ingenious and exceedingly plausible theory, if correct, establishes it upon an absolutely reliable basis.

In the simplest cases the cyst enclosing the dermoid is of the unilocular variety (*cystoma serosum simplex*). They frequently appear to be unilocular, and yet, on close examination, the remains of septa of a previous multilocular cyst may be discovered. In some instances the cystadenoma is the predominating part of the growth in which the dermoid portion may either be hemmed in or play such an unimportant part in the development of the cyst as merely to be an accidental discovery. Such specimens have been classified by Pfannenstiel as typical combination cysts.

The original elements of the dermoid, unless they have been dispersed, remain more or less closely localized to one area of the cyst-wall. The cyst itself may be of the simple follicular, simple serous, or, finally, of a pseudo-mucinous variety. One peculiarity of the dermoid is that it may be surrounded by a membrane in which exquisite amnion-like tissues may be identified.

In the multilocular cysts the dermoid elements may be situated upon the wall of the chief cyst or upon a septum in the midst of the cystadenoma. As a rule, the dermoid stands out as a projection from the cyst-wall, but when this is not the case its true nature will be recognized by its epidermal covering and growth of hair.

After considering the general details of his theme, Kroemer takes up the study of the various tissues and organs which he has found as constituent parts of these tumors, and marvellous in the extreme are some of his statements with regard to what he has found. Were it not for the fact that his training has evidently been well grounded in histology, and especially in embryology, before coming to this special research, one would be inclined to feel that his descriptions were those of a fantastic dreamer rather than of a scientific investigator. Upon close scrutiny, however, one finds himself falling into full accord with Kroemer's statements, and, with the concluding page, the conviction is irresistible that at last the origin and growth of these heterogeneous structures have been traced. No doubt some of his statements are open to criticism, and yet upon the face of his well-put-together article, which includes not only his own, but the work of preceding investigators, his conclusions appear to be quite firmly based. Until very strong evidence is brought in opposition to Kroemer's excellent studies we must put strong credence in his theories.

Not only have the simple embryological tissues been found, but many rudimentary organs are also described. For instance, a narrow tube running from an ill-defined oral cavity in one case is looked upon by Kroemer as an abortive attempt at the formation of an œsophagus.

Transverse sections through the dermoid usually show a preponderance of fatty tissue of a soft, yellowish-red, marrow-like appearance, which is subcutaneous fat, but is usually considered by the inexperienced as brain tissue. Interspersed throughout the fatty mass are connective-tissue processes, terminating internally in a sort of cerebral envelope which may contain bone or cartilaginous plaques. According to Kroemer, the rudiments of the brain are most easily recognized by the presence of retinal pigment, which is very commonly present in these tumors. Baumgarten, Marchand, Lazarus, Kapellar and Wilms have described more or less complete optical vesicles which existed in most instances as bilateral or pedunculated appendages. Even when the development does not progress beyond the faintest rudimentary stage, the retinal pigment may be found lining long drawn-out spaces on the border of the cerebral tissue. Arachnoidal pigment is also found quite frequently within the brain as fine, interrupted brownish lines. This aid to the recognition of the brain tissue is frequently unnecessary, for its macroscopic appearance is self-evident.

Baumgarten and Kapellar have likened their cases in their morphology to the cerebral hemispheres of a child. In one of Kroemer's cases, gyri cerebral fissures and a delicate vascular pia mater were noted.

The teeth which are found in more than half the cases are sometimes situated within a rudimentary oral cavity, and may project from the alveolar border, or not infrequently are completely enclosed within the bone. Superficially placed teeth upon the wall of the cyst are exceptional.

The dental structure is normal and Harres has described numerous varieties and forms of teeth, all of which Kroemer has found in his cases. In especially good specimens incisors, premolars and molars, arranged together on a rudimentary jaw bone, are found.

Rokitansky has described one case where a milk tooth had been absorbed and a permanent tooth was in process of projection. This secondary growth, according to Kroemer, may explain the large number of teeth in some of these cases. Schnabel, for instance, described a case in which three bone-plates contained one hundred teeth, while Plouquet in another case counted over three hundred.

The bony rudiments of the jaw are frequently of such irregular form that a differentiation between the superior and inferior maxillæ is impossible, and yet in some instances the bones are well developed and remind one of normal specimens.

Cases are described in which not only the upper jaw was present, but the antrum of Highmore and the hard palate were recognizable.

Of the other osseous structures, Wilms has described an upper jaw with well-formed molar and premolar teeth and a petrous bone; Grechen, an entire lateral wall of the cranium; Schramm, beside other bones, an

ossified rib ; Küster and Smigrodsky, pelvic bones and ribs ; Kapellar, several jointed bones ; Pfannenstiel, two bones joined by a ball-and-socket joint ; Omor and Ikeda, a finger, 5 cm. in length, with three joints and a nail ; Reverdin and Buscarlet, several fingers ; Klaussner, an entire extremity with jointed skeletal attachment and fingers which, although not showing phalanges, nevertheless possessed rudimentary nails.

Thornton extirpated a dermoid cyst in which a head-like process with teeth-bearing maxillæ, and the stump of an extremity tipped with long nails were found.

In Wertheim's case two extremities were situated upon the top of a dermoid which contained a well-developed jaw.

Axel-Key has described a case in which numerous fœtal rudiments, such as the head with rudimentary jaws, two under extremities and an ossified skull containing brain substance were found.

Finally Regnier has discovered the most complete embryological type yet reported, consisting of an entire skeleton, the right extremities of which showed complete jointing.

Graves also reports a case in which he found a head-like extremity with orbital sockets and eyelids provided with lashes.

From this description of the gross characteristics of these bizarre tumors Kroemer passes to the microscopical study of the various tissues and organs in which not only the macroscopical appearances are positively confirmed, but still more astonishing discoveries are made. As the scheme of development is unrolled one is fairly astounded by the multiplicity of tissues contained in these cysts, for portions of well nigh all the organs of the body in a more or less rudimentary state are brought to light. Not infrequently the growth of the dermoid is confined almost strictly to one organ, as, for instance, the remarkable case of v. Velitis, in which a mammary gland was situated upon a rib-like process. This gland not only possessed a nipple, but also a lactiferous duct, from which colostrum could be squeezed.

The parts of the body most frequently found in the dermoid are of the head end, as this is the first to develop in the normal embryo. In this way the frequent occurrence of brain-tissue, teeth, maxillary bones, rudimentary eyes, etc., is accounted for.

Of the three primary germinal layers all are represented in these tumors, but that layer which furnishes the skin, hair, etc., predominates in its growth and shows by far the most perfect organs. The ectoderm undergoes complete differentiation, clothing the external surface of the dermoid with skin which is provided with sweat and sebaceous glands, hair, and in a few instances, finger-nails.

A large part of the cheesy like matter of these cysts is excreted by the dermal glands. In the head areas the skin is so identical with that

of the normal scalp as to render a microscopical differentiation between the two structures absolutely impossible. Retention cysts of considerable size in the sebaceous glands are of frequent occurrence.

In some cases where there is a more or less ill-defined oral cavity a sharp line of transformation of the epidermis into the mucous membrane of the mouth may be detected.

Beside teeth which are not only normal in structure but also in form, other structures of the oral region have been described, such as the labial glands and lobulated glandular structures resembling the salivary gland. Fleischlen has described an entire submaxillary, and Simons a parotid gland, while Mortens has found muscular tissue underneath the mucous membrane, which he took for a rudimentary tongue. In one of Kroemer's cases muscular tissue was also found in the lingual area. While Kroemer has not found mammary tissue in any of his cases, well-authenticated specimens have been described by Reverdin, v. Velitis, and Yamagiva. In Yamagiva's case primary glandular carcinoma, starting most likely in the nipple, was discovered. (For an account of this very interesting case, see succeeding pages.)

The brain is found in all stages of development from the embryological to the adult type. Fatty degeneration and degeneration from irritation produced by the growing hair or from other causes is not infrequent; but even in advanced stages of degeneration corpora amylacea and arachnoidal tissue may still be detected. The brain is usually enclosed in a fibrous envelope consisting either of a single or several layers of connective tissue. In the latter event the outer layer is rich in elastic tissue and not infrequently contains cartilaginous and ossified areas. Both the dura and pia mater may be differentiated in some cases. The most constant and characteristic tissue is the choroidal pigment, which may always be detected on microscopical examination. Sometimes epithelial areas identical with the laminated pigment layers of the retina are observed, and occasionally a true optical vesicle is present.

Posterior to the optical vesicle open spaces and small particles of bone are found, which Born considers to be the rudiments of the ear. The brain substance does not always maintain its primitive character, but is sometimes differentiated into cortical and medullary layers, and in the former typical pyramidal cells may be seen on microscopical examination.

A complete medullary tube with central canal, anterior commissure, longitudinal sinus, and intervertebral ganglia enclosed in a vertebra, has been described by Kappeler.

In some instances cranial nerves and ganglia corresponding to the optic, trigeminus, etc., are found, and beside these nervous structures undoubted sympathetic ganglia have also been noted. Quite remark-

able in this connection is Kroemer's observation in one of his cases of a sympathetic plexus within the muscular wall of a rudimentary intestinal tract.

This full enumeration of tissues and organs arising from the ectodermal layer leaves no doubt as to its full representation in dermoids, and, notwithstanding the fact that it predominates in the development, the mesodermal and ectodermal layers are also included.

The most important rudimentary organs of the latter origin are the oesophagus, trachea, lungs, larynx, and nasal and pharyngeal cavities, in all of which ciliated epithelium is abundant.

The intestinal tract, on the contrary, is lined with cylindrical epithelium, which sometimes assumes the form of goblet-cells. Usually the mucous membrane is thrown into a typical villous arrangement, in the substance of which numerous intestinal glands are situated. The gastrointestinal tract is frequently surrounded by several layers of unstriated muscular fibre and within the mucosa typical Peyer's patches and solitary lymph-follicles are situated. Pommer has even described a cecum-like intestine with a vermiform appendix.

A still more astonishing discovery is that of Kroemer's of a rudimentary uterus, in which the branching glands of the cervix and the tubular fundal glands were easily differentiated.

As derivatives of the mesodermal layer, blood and lymph-vessels, unstriated muscle, cartilage, bone, marrow, and lymph-glands are found.

As a final result of this thorough review of the literature and his study of twelve cases, Kroemer comes to a full agreement with Wilms, who first offered substantial proof concerning the ovulogenous development of these tumors; but what the primary instigation to this anomalous growth of the ovum is, still remains a mystery. As Kroemer says, it is hardly correct to attribute the development to parthogenesis, for this is a normal process, established in lower plant and animal life for the propagation of species, while in this instance it is distinctly a pathological process in which the growth, differentiation of organs, etc., are atypical, and are apparently without a definite law.

While there is much yet to be investigated, I think Kroemer is deserving of the highest credit for his clear exposition of this subject.

His splendid marshalling of facts seems to me to completely overthrow the inclusion theory. According to Wilm's ovulogenous theory, one may explain the peculiarities of these unique tumors without difficulty, whereas by the inclusion theory it is very much like going around Robin Hood's barn to arrive at even a semblance of an explanation.

Carcinoma Developed from the Epithelial Lining of Dermoid Cysts. In view of this extremely interesting article upon the embryological and histological aspects of dermoid cysts, the question arises as

to the possible pathological changes in these misplaced but otherwise normal tissues.

We should naturally expect epitheliomata to originate from the epidermal structures so frequently found lining dermoid cysts, and in this we have not been disappointed, for several undoubted cases, including one reported by myself from the laboratory of Professor Chiari, in Prague, have appeared in the medical literature.

CARCINOMA OF THE GLANDULAR TYPE. Until quite recently epidermal carcinomata have been the exclusive type, at least of the well-described cases, reported; to this list, however, Yamagiva,¹ Professor of Pathology in the Royal University at Tokio, has added an extremely interesting and unique example of carcinoma of the glandular type associated with a teratoma of the ovary which, as he truly says, is yet a unicum. The case was that of a sixty-three-year-old woman, who had died from the effects of an abdominal tumor which reached to a point above the umbilicus. It was extensively adherent and was associated with metastatic growths in the retroperitoneal, mesenteric, and right supraclavicular glands. In general, the wall was thin (2 to 3 mm.), except in one area where it reached a thickness of 5 to 6 cm., and it was of a cartilaginous to a bone-like hardness.

The tumor consisted of one chief cyst, containing 5000 c.cm. of fluid, which made up two-thirds of the mass. As the result of a most painstaking and exhaustive examination, Yamagiva states that the tumor was a teratoma consisting of solid mixed tissues and of cysts, partly dermoid, partly follicular, and partly cysto-adenomatous, associated with cancer of the glandular type. In seeking the origin of the new-growth he came to the conclusion, after a very logical analysis of his case, that nipple-like growth or anomalous misplaced mammary gland on the inner surface of the large dermoid cyst was most likely the primary seat. While, as he states, his hypothesis cannot be proved positively, yet one must admit after reading his careful description and conclusions, that at least it bears the stamp of very strong probability. This case, therefore, marks an epoch in the history of dermoid cysts, and must be assigned a new place in their classification. There still remains, however, a niche to be filled, for as yet no instance of carcinoma of the glandular type arising from the special glands of the skin lining these cysts has been reported.

CARCINOMA OF THE EPITHELIAL TYPE. Until the publication of Bierman's case, in 1885, from Chiari's laboratory, no well-authenticated case, even of epidermal cancer, had been reported. This case is most minutely and carefully described, and leaves no doubt as to its being a

¹ Virchow's Archiv. vol. cxlvii.

carcinoma arising from the epidermal lining of the cyst cavity, and to Bierman, therefore, belongs the credit of having recorded the first unquestionable case of this type.

In view of the fact that the carcinoma presented all of the typical features of an epidermal carcinoma, and that there were present the normal elements of the skin and its glands, and, finally, that the cancerous processes were seen penetrating into the deeper tissues directly from the epithelial lining of the cyst, Bierman concluded that the latter was the point of origin.

A case of Krukenberg's presented an interesting variation, in that it was not so far advanced and therefore showed the earlier stages of the cancerous degeneration. The tumor was as large as a child's head and consisted of two dermoid cysts, one the size of a walnut, and the other the size of a fist. In the larger cyst numerous, somewhat prominent epithelial islands, which were undergoing carcinomatous change, were scattered over the inner wall. The cyst-wall varied from 2 mm. to 3 cm. in thickness, the thicker portions being points of greatest carcinomatous involvement. In a few places the cancer had entirely penetrated the wall and was exposed upon the outer surface. Metastases had taken place to the omentum, and several immovable nodules, which appeared to be formed by the right ovary, were found deep in the pelvis. In this case the epidermal islands had undergone carcinomatous degeneration, some of which were only in the beginning stage, while others were more advanced. The process had developed as a typical epidermal carcinoma; had then penetrated between and pushed asunder the fibrous lamellæ of the cyst-wall, and in a few places had reached the surface, from whence metastases had occurred into Douglas's pouch and into the omentum. The small cyst was only involved secondarily by invasion from a cancerous island of the larger cyst.

In my own case¹ it was possible to trace the epithelial layers of the cyst directly from the point at which they presented a normal arrangement to the border lines of the tumor, where the transition into the carcinomatous tissue was observed.

CLINICAL ASPECT OF THESE TUMORS. It goes without saying that a diagnosis of the earlier stages of carcinomatous degeneration of dermoid cysts before operation is impossible, for in none of the cases so far reported have there been any signs or symptoms noted which can in any sense be taken as peculiar to this complication.

After the cancer has extended so far as to involve or penetrate the wall of the cyst, forming hard, cartilaginous-like plates which may be palpated on the surface, or have given rise to palpable metastatic nodules

¹ American Journal of Obstetrics, vol. xxxviii. No. 3.

in neighboring organs, associated with pain and general failure in health, a provisional diagnosis may be made. Unfortunately, it is then too late to operate with any great assurance of relieving the patient. With the records of the cases thus far operated upon before us, we may say with little doubt that not a single one has been cured—a result which further points with great emphasis to the necessity for the early removal of all glandular and dermoid cystic tumors of the ovary before this complication arises.

In Thumin's case, for instance, the dangers of delay in operating are well illustrated. The patient had consulted Sir Spencer Wells and an eminent German gynecologist sixteen years before with regard to her tumor, to which an attack of peritonitis had already been ascribed, but they advised against operation, because the growth was thought to be an interstitial myoma. The subsequent growth of the tumor was gradual, and with proper care on the part of the patient the inconveniences and pain caused by it were bearable. Eight months before her admission to Landau's clinic she had suddenly experienced intense pain in the left side, which caused her to again consult Sir Spencer Wells, who still advised against operation on account of the extensive adhesions. As the patient continued to suffer, she consulted Landau, who removed the cyst and a portion of the abdominal wall involved by the carcinoma, but although the immediate recovery from the operation was satisfactory, the malignant process continued to extend, causing death six months later.

The age at which this complication is most likely to occur appears to follow the same general law of cancer in other regions, developing by preference in women approaching or beyond the menopause. The ages of the cases so far reported are sixty-three, fifty-five, forty-eight, forty-five, forty-three, forty-three, forty-one, twenty-nine, twenty-six, and twenty-one years.

As to the question of metastases in these cases, beside the retroperitoneal blood and lymphatic channels leading from the pelvic organs, another frequent route for transmission of the cancerous particles appears to be the fluid currents of the peritoneal cavity, through which secondary growths become engrafted upon the peritoneal surfaces more or less remotely situated from the tumor.

When the cancer has penetrated the cyst-wall and presents an exposed surface within the peritoneal cavity, neighboring organs may be involved by direct contiguity of surfaces, as seen in Thumin's case, where the anterior abdominal wall was the secondary seat of the new growth. The omentum, through adhesions to the tumor, may in the same way become affected, or by indirect metastasis where it remains free, as illustrated in Krukenberg's case.

In other cases the epithelial cells may be wafted to more remote parts of the peritoneal cavity, and give rise to metastatic growths upon the liver and under surface of the diaphragm, as seen in Bierman's case.

In this connection Muscatello's experimental work on dogs is called to mind, in which he showed quite conclusively that minute foreign particles, such as carmine granules, introduced into the peritoneal cavity, would invariably be swept, even against the force of gravity, toward the diaphragm, through which they gain access to the lymph channels and thence into the blood currents by which they were deposited in the various lymph-glands.

METHODS OF CLOSING THE ABDOMINAL WOUND AND THEIR RELATIONSHIP TO POST-OPERATIVE HERNIA.

For tenacity of purpose and painstaking care in the study of every detail of his subject, I am certain no medical paper of the past year can excel that of Abel concerning methods of abdominal suture and their relationship to the production of post-operative hernia.

Everyone who has had experience with the charity patients of a hospital knows how extremely difficult it is to keep trace of them after they are discharged, consequently absolute accuracy in statistics dealing with the ultimate results in operative cases is well-nigh impossible.

Knowing so well the obstacles met with in such a quest, the details by which Abel has obtained his remarkable results are extremely interesting, for they show how mountains may be moved even in these statistical studies if only a man resolutely sets his shoulder to the task.

As an evidence of the deficiencies existing in the hitherto published reports of the post-operative histories of cases, Abel refers to the results of many careful workers who have employed all ordinary means to obtain answers from hospital patients.

Stated in tabulated form the results were as follows :

	Number of patients.	Not heard from.
Chrobak	101	53
Byrne (Brooklyn)	367	151
Schmid	229	87
E. Cohn	88	25
Gusseran	60	11
Olshausen	23	16
Bücher	92	16
V. Erlach	67	16
Jacobs	102	27
Winter (private patients)	206	104
Winter (hospital patients)	671	177

Abel has undertaken to follow all cases, numbering in all 665, operated upon in the Leipzig Gynecological Clinic under Zweifel's directorship between the years 1887 and 1894.

Upon sending out his first lot of letters of inquiry almost half were returned as unknown, and a large number were unanswered.

As a close police registration is kept in all German cities of every inhabitant, Abel obtained from this source the residence of those patients from whom no answer had been received. Frequently, after tracing an individual from place to place in this way, he would at last find that she had moved to some unknown place. Not, however, to be frustrated in his search, he turned to the landlord of the last house in which the patient had dwelt, from whom information as to her whereabouts was occasionally found.

Failing to secure any clew in this way he then wrote to local officials for the names of relatives, from whom in many instances information sufficient to trace the patient was obtained. Accepting the old adage, "Misery loves company," he looked up contemporary patients, and through this source found some patients for whom he had sought a whole year in vain. In three instances the patients had inscribed assumed names on their admission blanks.

One patient had refused to answer seven letters because of a slight to her dignity, for she had been addressed as a chambermaid instead of as a housekeeper; she said: "So weit bin ich doch noch nicht in meinen Verhältnissen gesunken ich bin Haustälterin" (So far in my standing have I not got sunken, I am a housekeeper). Through this well-nigh never-ending search, Abel at last reached the astonishing result of tracing all but five patients.

When we consider the vast amount of work which this search has entailed we are impelled to offer nothing less than the highest compliments to this indefatigable investigator. In all 2390 letters were written to patients and 258 requests to other individuals for information. One vacation of three weeks was devoted to a laparotomy journey, as Abel terms it, during which thirty-one places were visited and seventy patients in all were examined.

Line of Incision. Under this heading Abel reviews the history of the abdominal incision, beginning with the reports of Ephraim McDowell's cases. It is unnecessary to go into the details of the historical side of this subject further than to say that Dieffenbach and Spencer Wells made the incision in the median line, and this plan was followed for some time by other surgeons; but later, as surgery developed, an opposing set of theorists arose who insisted that the only sure method of preventing post-operative hernia was to make the incision through the rectus muscle. The latter principle has been strongly advo-

cated by Werth, Peter Müller, and especially by Horwitz, and K. Abel, of Berlin. The latter surgeon speaks in the most depreciating way of the median incision, claiming that in the dense, poorly vascularized fascia there can be no tendency to the formation of firm adhesions or stable scar tissues.

According to his belief a scar in the linea alba is not sufficient to sustain the weight of the intestine, a statement which recent surgical history has proved to be absolutely untenable.

Concerning the cicatrix, which forms after the incision through the rectus, K. Abel thinks it is, if possible, even stronger than the normal muscle, and that the older the cicatrix the firmer it becomes.

Gersuny excised the linea alba and then sutured together the sheaths of the recti muscles, while other writers lay great stress on the preservation of this line.

In order to prevent the entire strain from falling upon one scar, Latzko makes the skin incision to the left, and continues it through the deeper lying tissues to the right of the umbilicus. Notwithstanding the fact that Sir Spencer Wells, in his earlier work, laid great stress upon the limitation of the abdominal incision, claiming that the mortality in his cases in which it was over six inches in length was 40 per cent., whereas in those in which it was six inches or less it was only 23.3 per cent., the experience of later surgeons has demonstrated that the mortality is little, if any, influenced by the mere length of the incision. Naturally, the more difficult the operation and the larger the tumor, the greater will be the length of the incision, and in equal ratio the higher the mortality.

Many operators have held that the risks of hernia decrease with the length of the incision. In historical order Abel has considered the various methods of suture, the length of the incision, and in fact every detail which may be directly or remotely involved in the discussion of the question; but as his article is no less than a monograph of ninety-six pages, I am compelled to omit the review of this interesting side of the subject and take up the more practical results which he has so fully worked out.

One meets with considerable difficulty in defining post-operative ventral hernia, for the limitations between a firm scar, simple stretching of the scar, overstretching of the scar, hernia-like projections, and actual hernia are often very slight. Prochownick, to whom Abel refers concerning this question, says that in most women one does not meet with a hernia in the true sense of the term, but a simple stretching of the whole or a part of the abdominal cicatrix.

Production of the Hernia. If the hernia occurs when the wound has healed *per primam* it must be attributed to a failure of union of the

fascial layer, which may have been due to the interposition of muscle or peritoneum between the layers of fascia or to the retraction of the fascia before the formation of a firmly binding cicatrix. The latter accident may be attributed to too wide intervals between the sutures or to the tearing out of a suture.

In all suppurating wounds there is invariably a thinning of the abdominal wall on account of the destruction of the fatty layers. If the fascia is not involved in the suppurative process the thinned cicatrix will remain uniformly resistant, but if necrosis of the superficial fascia occurs, the resultant scar, on account of the loss of elastic tissue, becomes less stable, and when the patient again resumes her daily vocation, becomes stretched and forms a prominence which can only be differentiated from a true hernia by the fact that the base of the swelling is broader than the apex. If a puerperal diastasis has existed previous to the operation, the hernia-like appearance induced through the stretching of the cicatrix becomes still more pronounced upon standing. In women with relaxed abdominal walls the overstretched part of the cicatrix may pass, quite gradually, over into the firmer part of the fascia, whereas in resistant parietes the border may be sharply defined by the bellies of the recti muscles.

The more extensive the fat necrosis, the more hernia-like becomes the ventral prominence. After wide-spread suppuration one not infrequently finds within the large hernial area secondary sacs projecting from adventitious holes in the attenuated fascia.

Examination of the Cicatrix. In the examination of the ventral cicatrix Abel has been most painstaking and critical, allowing no point to escape which should be noted in a statistical study of this kind. Frequently we hear surgeons say they never have hernia follow their operations, and yet upon close questioning they will qualify the statement by saying, "at least sufficient to give discomfort or cause disability." Statistical papers in the hands of an honest but prejudiced observer may be so doctored as to leave the truth wholly concealed, but Abel, with true scientific spirit, brings to light every deviation from the normal, and the reader may judge for himself whether his conclusions are right or not.

As a test of the stability of the cicatrix the abdomen must show no undue prominence from coughing or upon the exercise of intra-abdominal pressure, and upon palpation no unevenness or hole-like depressions in the cicatrix should be found. He warns against overlooking small omental herniæ, which are frequently only located by a careful palpation with the finger-tips. Small openings may be found plugged with omentum, which may be reduced but recur with a strong rebound upon coughing.

Under the heading of predisposition to hernia, Abel has classed fifteen

cases. In five of these there was sufficient thinning of the fascia from suppuration to permit a strong succussion impulse upon coughing although no actual hernia had yet developed.

Time of Appearance of Post-operative Hernia. Concerning the time when these herniæ occur, Prochownick has estimated that four-sevenths appear in the first year, two-sevenths in the second year, and only one-seventh later. To reach definite conclusions upon this point, Abel says one cannot rely upon the patient's statement, for the majority only notice this sequel when it begins to give discomfort.

In his investigation the hernia was noted by the patients as follows : 38 per cent. within the first half-year ; 26 per cent. within the second half-year ; 13 per cent. within the second year ; 23 per cent. still later. The results of his examination, however, were entirely at variance with the patients' observations. The small size of the hernial opening often accounted for their being overlooked by patients. Among 114 women, 41 (over one-third) had herniæ, the openings of which were not patulous to the finger-tip ; of these patients only about 50 per cent. were conscious of the presence of these tiny openings. In apparent contradiction to his statement that post-operative herniæ develop soon after operation, Abel cites seven cases in which the first examination failed to reveal any deficiencies in the cicatrix, and yet herniæ subsequently developed. Another interesting observation along this same line is the development of a second hernia years after the appearance of the first or after its obliteration by operation.

Concerning the increase in the size of the hernia, Abel found that 35 per cent. remained stationary after the third year. Over two-thirds of these were very small, not admitting one finger. Leaving these very small herniæ out of consideration, in only 19 per cent. of cases was any increase in size noted after the second year.

When the adventitious openings were over the size of a silver dollar, only 22 per cent. ceased to grow within the first four years, while of those with openings admitting a fist not a single one showed any abatement in growth.

Predisposing Factors to the Production of Post-operative Hernia. Among the strong predisposing causes of post-operative hernia Abel counts drainage tubes and gauze, extra-peritoneal treatment of the uterine stump after hysteromyomectomy, and incomplete closure of the abdominal walls, through the suture of the walls of cysts and extra-uterine sacs to the wound.

In nine cases of cœliotomy for tuberculous peritonitis, six cases were followed by hernia due to the healing of the wound by unhealthy tuberculous granulations. Also in the cases of so-called pseudomyxoma peritonei, the healing of the wound is usually retarded.

INFLUENCE OF METHODS OF SUTURE UPON THE PRODUCTION OF HERNIA. As a number of methods of suture have been employed by Zweifel, Abel has secured a considerable series of cases for comparative study. The cases were separated into the following chief groups:

1. The simple button suture; 102 cases.
2. Layer suture with separate coaptation of muscle; 52 cases.
3. Layer suture with isolated coaptation of fascia; 280 cases.

With regard to hernia following healing *per primam*, the cases were distributed as follows:

	Per cent.
Button suture, 61 cases with 18 herniæ	29
Muscle suture, 25 " " 6 "	24
Fascial suture, 224 " " 20 "	8.9

The cases in which the fascia was sutured in a separate layer show some variation in the percentage of post-operative hernia according to the kind of suture material employed:

	Per cent.
Chromicised catgut was used in 85 cases with 7 herniæ	8.3
Sublimat-alcohol " " " " 30 " " 3 "	10
Xylol " " " " 59 " " 7 "	11.9
Cumol " " " " 50 " " 3 "	6

A study of the cases in which suppuration of the abdominal wound occurred gave the following results:

	Per cent.
50 cases with simple button suture 34 herniæ	68
27 " " muscle " 18 "	64
52 " " fascial " 16 "	31

Of 49 cases where the degree of suppuration was known, in 33 it was superficial, and only 15 herniæ followed; whereas in 16 cases of extensive suppuration, hernia resulted in every instance.

Arranged according to the duration of the suppurative process, the cases were distributed as follows:

	Per cent.
2 weeks' suppuration, 40 cases with 16 herniæ	40
3 " " " 35 " " 19 "	54
4 " " " 20 " " 13 "	65
over 4 " " " 25 " " 20 "	80

In estimating the length of suppuration Abel has, I think, quite properly assumed that the cases of short duration were superficial, whereas in those where the convalescence was very slow from this complication, it was quite extensive. In the first the tendency to hernia is less, because the deeper lying layers of fascia are not involved, whereas in the latter the opposite condition will be found.

That the size of the hernia also depends upon the same factor is shown by the following table:

Hernial opening over the size of a silver dollar.						Per cent.
2 weeks' suppuration, 40 cases, 4 times						10
3	"	"	35	"	6	17
4	"	"	20	"	6	30
over 4	"	"	25	"	5	31
"	6	"	9	"	5	56

Through these tables it appears that the resistance of the scar-tissue is very greatly impaired by suppuration of the wound, and that an undisturbed healing is the primary factor in a faultless union of the cicatrix, or, in the words of Prochownick, healing by primary intention is the strongest prophylactic against post-operative hernia.

CONDITIONS OF THE ABDOMINAL WALL AS PREDISPOSING FACTORS TO HERNIA. In the discussion upon the subject of the healing of abdominal wounds before the Sixth German Gynecological Congress, Martin said: "The basis of our discussion is not uniform, because the varying conditions of the abdominal walls are not taken into consideration." The proper healing depends upon whether the abdominal wall is resistant or relaxed, or is very fatty, and upon the state of its general nutrition. In order to determine the relative influence of the deposition of fat in the abdominal wall upon the production of hernia, Abel divided the cases of primary healing as follows:

Cases of hernia where there was little deposition of fat						Per cent.
"	"	"	"	moderate	"	1.5
"	"	"	"	marked	"	3.7
"	"	"	"	very	"	4.3
"	"	"	"	very	"	6.9

This table, I am certain, is in accord with the experience of every surgeon, for it is a well-known fact that women with excessively fatty abdominal walls are especially prone to suppuration.

INFLUENCE OF CONSTITUTION UPON THE CICATRICAL FORMATION. Under this caption is considered the condition of the patient relative to her strength or weakness, to her anæmic or non-anæmic condition, to her age, and to the number of children which she has borne. Under all of these conditions no great variation in the healing of the wound was noted except in old women who had borne a number of children. Contrary to expectation in these cases, the percentage of healing was exceptionally good, which is in exact opposition to the statement of Olshausen, that women with thin abdominal walls are prone to hernia, because of the formation of these cicatrices.

In seeking an explanation for the greater frequency of hernia in women with fat abdominal walls, Abel believes it lies in the failure of approximation of the fascial layers and in the interposition of peritoneum and fat between these layers during the closure of the wounds. The difference in the results between the patients whose wounds were closed by button sutures and those in which the fascial

layers were united by separate stitches is strikingly in favor of the latter plan.

The arrangement of the cases according to the thickness of the abdominal wall shows the following percentage difference. By way of explanation I may say that the button suture is a variety of through-and-through suture :

				Separate fascial suture.	Button suture.
				Per cent.	Per cent.
Patients with fatty layer, 6 cm. thick, . . .				25	75
"	"	"	" 4 to 6 " " . . .	21	40
"	"	"	" 2½ to 4 " " . . .	12.5	31
"	"	"	" 1½ to 2½ " " . . .	8	22
"	"	"	" 1½ " " . . .	2.4	29

As is quite evident from this table, the frequency of hernia decreased with the thickness of the abdominal wall.

As a result of this study of the special conditions governing the healing of the wounds, or rather the causes predisposing to herniæ, Abel sums up the main principle in this sentence: "I believe the condition of the abdominal walls influences the strength of the cicatrix only so far as it renders easy or difficult the exact union of the fascial layers. At least this is true so far as post-operative herniæ are concerned."

With regard to the size and number of herniæ, Abel also concludes that they likewise depend upon the method of suture and the healing of the wound.

THE LENGTH OF THE INCISION. The larger the incision the greater the chances for a post-operative hernia, is a generally accepted law, and yet it has remained for Abel to definitely establish it upon a scientific instead of an empiric basis. The cicatrix remained absolutely stable in cases of primary union as follows :

				Button and muscle suture.	Fascial suture.
				Per cent.	Per cent.
Incision	9 to 11 cm. in length	. . . . .		100	100
"	12 to 15 " "	. . . . .		84	92
"	16 to 19 " "	. . . . .		53	96
"	20 to 23 " "	. . . . .		50	67

Not only is it true that the percentage of herniæ increases with the length of the incision, but the number of the openings is greater and their size larger. While it is held by many writers that coughing and efforts at vomiting are potent predisposing or active factors in the production of herniæ, Abel denies this influence when the wound heals *per primam*; on the other hand, if he takes the small number of suppurative cases and studies them from this stand-point, he must admit the validity of the claim. Accepting as an established fact that the method of suture and the healing by primary union are the chief, if not the only, factors in the prevention of hernia, Abel's next fixed proposition, which

is also based upon close observation, is that after the wound is completely healed no further influences can act deleteriously upon the permanency and resistance of the cicatrix. Following this proposition the question naturally arises, "When is the healing completed?" Morris, who has studied the healing of wounds in rabbits, claims that the peritoneum is fully united in seven days, the muscular and fibrous layers in fourteen days, and the skin in eighteen days.

After a review of his cases, Abel arrives at the conclusion that the patients may with absolute safety get out of bed the middle of the third week after operation.

INFLUENCE OF THE ABDOMINAL BANDAGE. Abel unreservedly says the wearing of a bandage has absolutely nothing to do with the prevention of hernia, and offers the following convincing statistics in proof :

	Cases. Per cent.	Hernia. Per cent.
Bandage never worn	20	95
" worn until the 6th month	32	97
" " " " 9th "	26	96
" " " " 1 year	27	96
" " over 1 "	22	82
" " " 2 years	42	88
" " " 3 "	22	82
" " " 4 "	12	75

Notwithstanding the fact that the bandage plays no part as a prophylactic measure, Abel does not advise discarding it, for it may serve a useful purpose in preventing the increase in size of the hernia should it occur, and it also acts as a protection for the surgeon against the imputation of negligence in case a hernia follows the operation.

Concerning the well-nigh classical statement that the production of hernia stands in a direct causal relation to the time when the patient resumes work, Abel also offers statistics which absolutely disprove this time-worn statement. In the entire number of cases seen by him not a single instance was found in which either the number or size of the herniæ could be traced to this source.

INFLUENCE OF PREGNANCY UPON THE CICATRIX. Again Abel overturns our preconceived ideas by stating that pregnancy, following immediately or remotely after operation, plays absolutely no part in the production of hernia.

This conclusion is drawn from the examination of forty-seven women who bore altogether seventy-one children after operation. Two were operated upon during pregnancy and came to full-term delivery without any injury to the firm ventral cicatrix. Fourteen women whose wounds had healed *per primam* became pregnant within the first and second years subsequent to operation without any signs of herniæ, while eleven women

in whom the fascia had been sutured separately became pregnant within the third year with like results.

Among all the cases in which the latter method of suture had been employed not a single case of post-operative hernia developed

As an incidental remark he says that in twelve women who became pregnant in later years after operation, herniæ had been noted in seven instances before pregnancy, while three thought that the scar had been firm up to that time. Concerning the remaining two he had no reliable observations or statements.

Site of the Hernia. The majority of herniæ occur in the lower third, and especially at the end of the incision. The chief cause for this is the greater frequency of infection in this area, and in addition the anatomical weakness of the abdominal wall below Douglas's semilunar line, due to the loss of one layer of fascia, naturally acts as a predisposing factor.

Symptoms Accompanying Hernia. The symptoms arising from post-operative hernia depend upon the size, form, and contents of the sac. In general the small herniæ give rise to less discomfort than large ones, and those which contain omentum less than those containing a loop of intestine. The greater the contents of the sac in proportion to the size of the hernial ring the greater is the discomfort. Quite naturally there is also considerable difference in the character of the symptoms between a true hernia and a simple prominence due to overstretching of the fascia. The latter condition gives little or no discomfort and does not decrease the ability to work. In not a few instances pain arose in cases of small herniæ which had passed through many years without causing any discomfort.

Patients suffering with the smallest herniæ were fully able to work, but with the increase in size this ability decreased, while the coincident pain or discomfort increased.

Of forty-five women with herniæ ranging from the smallest up to the size of a dollar, only twelve wore bandages, the most, merely as a precautionary measure; others, however, on account of the decrease in pain. All of the forty-five women, with one exception, were fully able to work.

All patients with large herniæ, with one exception, wore bandages, without which they were uncomfortable. A good-fitting bandage which prevented the sagging of the intestines into the hernial sac rendered a considerable number of women who were otherwise totally incapacitated comfortable and able to work. This same relief was noted in cases of simple overstretching of the cicatrix.

Operation for Post-operative Hernia. The separate suturing of the fascia is recommended here the same as in the primary closure of the

œliotomy wound. The results of the operation depend upon the size and variety of the hernia, the larger the adventitious opening the less the chance for recovery. Of eleven cases operated upon in the Leipzig clinic there were nine recurrences.

In three cases the hernia recurred to the inside of the new cicatrix. None of the patients had recurrent herniæ over the size of a silver dollar, while in four instances it was not over the size of a penny. The symptoms in every case, if not cured, were at least improved by the operation. These cases prove that the earlier the operation the greater the chances for a cure.

Stability of the Cicatrix after Repeated Laparotomies. In these cases the permanence of the secondary scars depends largely upon the care with which the wound is resutured. If the old scar is strong and resistant the second incision may be made close to it; on the other hand, if it is stretched and attenuated, it should be excised.

Remarks upon Abel's Paper. This extremely instructive study is of the greatest importance because of the confirmation of many points hitherto somewhat tentatively held by surgeons, and of the overthrow of other theories which have been very strongly advocated. The two main points which he brings out with especial force are, first, the necessity for an accurate coaptation of the fascial layers, and, second, the healing *per primam*.

Having had an abundant opportunity of observing the results of incision through the rectus muscle and in the linea alba, I have been firmly convinced that it matters not where the incision is made, provided the fascia is firmly coapted and held so until perfect union has taken place.

In our older methods of suture we employed first a running silk or catgut suture to the peritoneum, and interrupted through-and-through silkworm-gut sutures to complete the closure. With this method suppuration of the wound and post-operative hernia were by no means infrequent, notwithstanding the greatest care in the closure of the wound. Stitch-hole abscesses of varying extent and depth, and more or less extensive suppuration occurred in a considerable percentage of cases, leaving discharging fistulous tracks and an impairment or entire deficiency in the fascial layers.

This method was discarded, therefore, and the successive layers of the abdominal wall, peritoneum, aponeurosis of the recti muscles and skin, were united separately, buried silk sutures being employed for the peritoneum and fascia.

So far as the occurrence of suppuration and post-operative hernia were concerned, a distinct improvement was noted, but when the wound became infected a persistent fistulous tract was established which only

healed when the sutures were cast off or removed artificially. Following the lead of Halsted, silver-wire sutures were substituted for silk and again an improvement in the healing was noted and post-operative hernia became of very infrequent occurrence.

In many instances the germicidal influence of the silver was sufficient to limit the suppuration and to finally allow complete granulation and cicatrization of the wound, without the removal of the suture. With an extensive experience in the use of the silver wire we have found, however, that it also is not entirely free from criticism, for in some instances although the wound may have healed per primam, the wires have worked out to the surface and have been spontaneously discharged or have been removed.

To the credit of the silver wire it must be very emphatically said that when it is applied as a mattress suture it is only in the rarest instances that ventral hernia occurs as a post-operative sequel.

The essential point in placing these sutures is to catch enough of the aponeurosis to firmly bring the borders of the fascia not only into complete coaptation, but also to slightly elevate them into a median ridge.

Only sufficient wires should be introduced to carry the tension, the remaining work of coaptation being left to catgut sutures. Thus in a wound 10 cm. (4 inches) in length not more than three sutures should be applied, or at most four, the first 2.5 cm. from the lower angle, one in the middle, and the third 2.5 cm. from the upper angle of the wound. Between these a sufficient number of catgut sutures should be introduced to bring the fascia into close apposition and to leave no point where the tip of the little finger may enter. A point which Abel has not considered in his otherwise thorough article, is the advisability of the obliteration of dead spaces. Nothing is more conducive to primary healing of wounds than the absolute avoidance of all oozing or accumulations of blood, which may become infected and give rise to suppuration after the wound is closed. When the abdominal wall is thick and fatty a very loosely running catgut suture may occasionally serve a good purpose in bringing the thick pads of fat together, thus obviating this complication.

To meet the requirements for perfect primary healing even the minutest oozing should be checked, and painstaking care in this respect will always be repaid by better results.

A point of especial importance is the avoidance of penetrating cutaneous stitches, for notwithstanding the greatest care in cleansing the skin, the staphylococcus epidermidis albus may still remain, and, although under ordinary circumstances a very benign organism, it may, in case the local or general resistance is very much below par, give rise to suppuration.

The subcutaneous stitch of Halsted and Marcy fully obviates this danger, and in addition serves a beautiful cosmetic purpose, for its careful application is frequently followed by only a hair-line cicatrix. In the colored race I have seen the healing so perfect as to simulate a restoration *ad integritatem*, the scar being represented by an almost invisible pale line.

As Abel does not suggest the successive steps of the closure of an abdominal wound, I venture to append the one in vogue in the Gynecological Department of the Johns Hopkins Hospital, which has given very satisfactory results. This method is based upon the principle so strongly insisted upon by Abel, viz., close and accurate coaptation of the fascial layers. By way of explanation, I may say that the incision in by far the largest percentage of cases is made in the median line, simply because it is easier; should it fall outside in the rectus muscle it is continued into the peritoneal cavity without any effort being made to strike the linea alba.

Method of suture. 1. Absolute control of hemorrhage, even to the minutest capillary oozing.

2. Continuous suture of the peritoneum with catgut.

3. Suture of the aponeurosis of the recti muscles with a sufficient number of silver-wire mattress sutures to relieve the wound of all tension (sutures, as a rule, 2.5 cm. apart).

4. Catgut sutures between silver wire, sufficient to make perfect coaptation and leave no vulnerable point.

5. If subcutaneous fat is thick, a loose-running fine catgut suture to lightly bring it together and prevent gaping.

6. Subcutaneous catgut suture.

7. Dressing of silver-foil and gauze held with adhesive straps.

8. Abdominal bandage.

By the employment of a subcutaneous catgut suture all concern as to the removal of stitches is obviated, and the healing of the wound is almost invariably quite ideal.

This method is given merely as one of a number of good ones. My personal experience with it is such that I have no hesitation in using and recommending it.

It cannot be doubted that the methods employed by Edebohls, Noble, and others are excellent, and may be employed with the greatest assurance of good results.

As to the fascial sutures, it appears highly essential to use a non-absorbable material, and of these silver wire and silkworm-gut are preferable. If the thirty-day catgut of Edebohls can certainly be sterilized and rendered resistant for the full term claimed for it, it likewise should be a good material. The chemical sterilization of catgut has,

however, fallen into such bad repute in former years that even the newer methods can with difficulty free themselves of the dangers called attention to with so much force by Kocher.

GONORRHOEA IN WOMEN.

A recent controversy between Behrens,¹ the chief official examiner of prostitutes in Berlin, and Neisser,² of Breslau, whose name is so well known on account of his association with the discovery of the gonococcus, while it has not brought the principals nearer together in their views, has at least demonstrated two facts to the reader: First, that the treatment of gonorrhœa in women is as yet by no means perfect, and, second, that for the diagnosis one cannot depend solely upon the microscopic examination of the secretions for gonococci.

This controversy between Behrens and Neisser was incited by a paper read by the former before the Berlin Medical Society, in which he laid down two leading propositions: first, that acute gonorrhœa in men is best treated by rest in bed, by local applications of ice, and by frequent urethral injections of ice-water in conjunction with mild astringents. Through this means a rapid cure is effected, and with the subsidence of the symptoms the gonococci disappear.

His second proposition is that in women the conditions are not the same, for there may be a permanent or intermittent disappearance of the gonococci with a continuance of the clinical symptoms, or the latter may subside with a persistence of the gonococci, or both may disappear simultaneously.

This naturally raises the question of how long are women infected with gonorrhœa to be kept under treatment before a cure is effected?

According to the official instructions to the medical examiners of Berlin, prostitutes are to be held under surveillance so long as they are capable of transmitting infection. The point, then, is to determine when the potency of the infectious matter ceases. Neisser and his students maintain that after the disappearance of the gonococci, notwithstanding the persistence of clinical symptoms, the disease can no longer be transmitted. Behrens, along with many gynecologists, however, takes strong issue upon this point, for, according to their experience, the microscopical detection of the gonococcus is so uncertain as to render this means of diagnosis very unreliable, and they depend, therefore, upon the clinical symptoms.

Behrens divides cases of gonorrhœa into two groups: one in which the acute symptoms are so self-evident that a microscopic examination

¹ Berliner klin. Wochenschrift, 1898, No. 6.

² Ibid., No. 9.

is unnecessary, and a second in which the purulent discharge from the urethra, from Bartholin's glands or from the cervix, is of doubtful gonorrhoeal origin.

In considering the acute stage of this disease, Behrens calls attention to some new factors in the distribution of the infectious matter, which are of great interest.

He says the clinical course depends upon whether the hymen is intact or only superficially torn, and whether the vagina is narrow or relaxed. When the vaginal introitus is narrow, especially when the hymen is persistent, gonorrhoea manifests itself chiefly as a vulvitis with a discharge of copious viscid pus which stains the linen a green or greenish-yellow color. In some instances it may be so abundant as to partially or completely fill the vaginal vestibule. The labia minora as well as the hymen are reddened and swollen, and frequently the labia majora are swollen while the mouth of the urethra, the clitoris and prepuce are also similarly affected.

Concerning the primary site of infection, Behrens believes it is the vulva, and that the urethra becomes secondarily inflamed through capillary attraction. Such cases are best treated by sitz baths and the application of medicated pads about the vulva.

If upon retraction of the labia the lower portion of the vagina appears reddened, it is a distinct sign of danger and warns the physician of the difficulty which will most likely be encountered in curing the ailment. From the irritation of stagnant pus the vagina becomes reddened, loses its epithelium and becomes eroded.

Although one is forced at this stage to employ vaginal douches, there is, nevertheless, danger of distributing the purulent matter and thus infecting the upper vagina and cervix. Later, upon inspecting the portio vaginalis with a speculum, it may be found to be bright red and discharging pus which gravitates into the vaginal vault.

After a time the entire vagina becomes involved and the vaginal epithelium is desquamated, leaving the underlying tissues of an angry red and eroded appearance. According to Behrens, the receptive portions of the female genital apparatus for gonorrhoeal infection are the vulva and vaginal vault, the remaining portions of the vagina becoming secondarily infected from these primary sources. The erosion of the vagina and skin adjacent to the external genitalia is a form of irritative eczema, and is not a specific gonorrhoeal inflammation.

The characteristic red spots, or maculae gonorrhoeae, which have been described by Sanger as the reddish inflamed exits of Bartholin's ducts, are also of the same nature.

According to this view of Behrens, we have two separate pathological processes to deal with in acute gonorrhoea: first, the purely specific

inflammation, which especially affects the vestibule and portio-vaginalis, and, secondly, a condition of erosion which involves the skin around the external genitalia and the mucosa of the middle portion of the vagina.

In cases where the vagina is greatly relaxed the gonorrhœal inflammation remains confined to the primary focus of infection, because there is a free escape of pus and no stagnation of irritating discharge.

In chronic gonorrhœa the appearance of the external genitals is entirely different from that seen in the acute process.

The escape of purulent matter is confined to the urethra, Bartholin's ducts and the cervical canal, and there are no coexisting signs of local inflammation.

In Behrens's earlier work he relied entirely upon the subsidence of the clinical signs as a proof of the cure of the disease, but when the bacteriological examination of the secretions came into vogue he resorted to this means with great confidence in its scientific value. After a careful trial, however, he has abandoned it as unreliable, and has returned to the purely clinical methods of diagnosis.

The chronic forms of gonorrhœa are designated by Behrens as blennorrhœa rather than by the former name. The purulent discharge in these cases is exceedingly difficult to check, and the employment of every remedy often proves of no avail. In chronic cases the presence of the gonococcus is very variable; in some instances it is never found, in others it is present at one time, at another absent.

It is these results which give rise to Behrens's skepticism as to the diagnostic value of the microscopical examinations.

After employing a great number of bactericidal remedies he has at last returned to simple astringent douches. In vulvitis and vulvo-vaginitis he advises the application of a cotton pad soaked in alum solution to the inflamed parts, which is renewed several times daily. When the vagina is involved douches of alum solution are given daily, and, regardless of whether the portio-vaginalis is infected or not, a 5 per cent. solution of chloride of zinc is also injected daily through a speculum as a supplementary remedy.

For the urethritis an application of zinc chloride solution is made by means of Playfair's sound.

When only the vulva or the mouth of the urethra is involved no injections should be administered, for by this means the disease may be spread still higher rather than limited in its extent.

Neisser vigorously attacks Behrens's article, for he not only claims that the presence of the gonococcus is the *sine qua non* of a diagnosis, but that the employment of active bactericidal remedies is absolutely indicated.

He unhesitatingly admits that the treatment of gonorrhœa in women

is an extremely difficult matter, but claims that the early recognition of the disease and the prompt employment of active remedies will stop its progress and bring about a cure before it reaches its strongholds in the uterus and tubes.

Even though these organs may become infected, a cure is still possible, although residual pathological products may remain and give further trouble. Neisser claims that the results of treatment are distinctly better in the Breslau than in other clinics, which he attributes to the inauguration of the active rather than the passive policy of treatment, and also to the fact that no patient is considered cured until the gonococci are no longer detected.

Of late Neisser has employed ichthyol in the active treatment of gonorrhœa. It is preferable to the silver salts previously recommended by him, because its application is easy and its effects are prolonged and without irritating action. Applied in the form of urethral bougies or as ichthyol-glycerin it is very efficient.

He considers as the chief aims in the active treatment, the destruction of the gonococci and healing of the inflammation before it becomes localized in the deeper tissues, or in certain organs where it is difficult or absolutely impossible of remedial access.

The curative treatment, if it is to be effective, must take place, therefore, in the acute rather than in the chronic stage. One set of physicians insists that an expectant policy is safer, whereas others institute treatment while the inflammation is yet in an acute stage and confined to the urethra, vulva, external genitalia, and cervix. Their rule is based upon the principle: the quicker the better. To the latter class Neisser unhesitatingly attaches himself.

The expectant plan of treatment, according to him, is a dangerous delusion, for while the clinical symptoms of gonorrhœa may disappear, which, according to Behrens, is a sign of cure, gonococci capable of transmitting the infection may still remain.

The difficulties in the way of treatment in the female are much greater than in the male, for the injection methods employed so successfully in the latter are distinctly dangerous in the former. A spread of the infection to the upper portions of the genital organs or to the bladder may result from vaginal or urethral douches.

Medicated bougies, also, do not lead to the most satisfactory results, although at present they appear to be the most available means of applying remedies.

The greatest difficulty met with in woman is that the disease is allowed to run on a long time before she applies for treatment. Through this procrastinating policy on her part the uterus and tubes may become infected and the gonococci are deeply buried in the underlying tissues.

The cardinal principles insisted upon by Neisser are, first, the routine microscopical examination for gonococci, and, second, the institution of active treatment at once. Like all heated controversies, it seems to me that there is in this a middle path, for to depend absolutely upon either the clinical symptoms or upon the microscopical examination of the pus, might lead to radical errors. Certainly Behrens is right when he claims that the persistence of symptoms, even though the gonococci are not found, is a sufficient indication for treatment and for the belief that the gonorrhœa still exists.

On the other hand, Neisser's position is also quite as tenable when he claims that the disease likewise exists if gonococci are still present, notwithstanding the disappearance of all clinical symptoms.

Of the two positions occupied by Behrens and Neisser, the latter is certainly the more scientific. The routine examination of all cases for gonococci is just as essential in the careful study of these cases as the search in the sputum for tubercle bacilli in cases of suspected tuberculosis.

From the stand-point of the general practitioner who may not be a skilled microscopist, the close observation of the clinical symptoms as depicted by Behrens is of much greater value than the microscopical examination of the pus, for acute gonorrhœa is sufficiently marked in its characteristics to leave little doubt as to the diagnosis.

It is, however, not the acute stage which presents difficulties in the diagnosis, but the later or blennorrhœic stage, when the acute signs of inflammation have subsided and only a scant secretion of purulent matter still persists.

As these cases are frequently the ones which transmit the infection almost indefinitely, no means should be left unemployed to determine whether or not the specific organisms have disappeared.

To this end not one but many examinations of the secretion should be made, and only when these conditions have been complied with and the bacteriological results have proved negative, can one with any assurance assume that the danger of transmitting the infection is past.

Again, as to treatment. The active plan of Neisser also appeals to me, for by following his precautionary advice no more danger can come from the employment of germicidal agents than from the simple astringents of Behrens; in fact, it seems to me that the argument is decidedly in favor of the former's position. Tentative methods of treatment are decidedly to be recommended when active agents are dangerous, but when this objection is not valid as in this case, it is certainly true that the physician is best worthy of his office who adopts the combative policy.

Neisser's suggestion as to the use of ichthyol is an excellent one.

Whether this drug is an active germicide, Neisser does not state, but in view of the fact that it has proved very efficacious in acute skin diseases and in other superficial inflammations, I see no reason why it should not be of benefit in gonorrhœa.

The ease of its application and the soothing influence exerted upon the inflamed mucosa are certainly in its favor.

TUBERCULOSIS OF THE PERITONEUM.

Accidents in surgery rarely lead to good results. In the treatment of tuberculosis of the peritoneum, however, there has been an exception to this rule, for the first instance of known cure of this disease followed the opening and evacuation of ascitic fluid from the abdomen of a patient supposed to be suffering with a disease amenable to operation. In the subsequent course of this case apparent recovery was noted.

From an accidental suggestion this line of treatment has been widely tested, and there can no longer be the slightest doubt as to its permanent curative effect.

Strange to say, a simple exploratory incision has proved quite as effectual in staying the progress of the disease as the more radical measures, such as salpingo-oöphorectomy, hysterectomy, and excision of the omentum. Some two or three years ago we thought the drainage which was usually employed in these cases was the mainstay of the treatment; later, however, the simple evacuation of the ascitic fluid and immediate closure of the abdominal wound were found to be quite as efficacious.

What the relation of cause to effect is, no one so far has clearly demonstrated. Theory after theory has been advanced, some of which are plausible, while others may be passed over without second thought. Until we know more definitely the relationship of cause to effect, our treatment must necessarily be empiric; but since our chief aim in medicine is to exercise the healing art, such an end as that accomplished in the treatment of tuberculous peritonitis may be looked upon with much pleasure, although the exact mode of therapeutic action may be unknown.

Friedrich Merkel,¹ of Nürnberg, has added two interesting cases of apparently healed tuberculosis of the peritoneum to the already rather extensive literature, which he makes the text for a short and interesting review of the subject. Following the report of his two cases, which in the gradual disappearance of symptoms conform to the usual course of healing, he asks the question, "What is the primary focus of the disease in our two cases?"

¹ *Zeit. f. Geburts. u. Gynäk.*, vol. xxxix.

According to the statistics of Schmalmack, Phillips, Borschke and others there is but little doubt that the peritoneum is seldom, if ever, the primary seat of the infection. The initial focus may exist in the lungs, pleura, mesenteric glands, intestines, Fallopian tubes and uterus, and, less frequently in other more remote parts or organs.

Merkel has himself called especial attention to the frequency of the lymph-glands at the bifurcation of the trachea as the initial point of infection. This writer also calls attention to the asserted clinical fact that peritoneal tuberculosis occurs more frequently in women than in men. This statement, however, when tested by the autopsy records of König, obtained from the Göttingen laboratory, and of Schmalmack, of Keil, is proved incorrect, for in both instances the ratio of women to men is about as one to three.

Symptoms. In discussing the symptoms of peritoneal tuberculosis, Merkel says they depend upon whether it is of the dry fibrous or fibro-adhesive, or of the exudative type. The latter is much more easily diagnosticated than the former.

EXUDATIVE TYPE. The onset of the disease is not attended with acute pain, the patient usually giving a history of having fallen off in weight and strength, while at the same time a considerable increase in the size of the abdomen has been noted. Dragging sensation in the sides, backache, changed urinary excretion, constipation, and a bearing-down sensation are usually complained of.

Physical exploration reveals more or less abdominal distention, which may reach a circumference of 100 cm. or more. The skin of the abdomen is glistening, the ribs are pressed apart somewhat wider than normal, and the superficial veins appear quite tense and prominent. On palpation large fluctuating waves are discovered, and the tenseness of the abdomen frequently precludes the possibility of outlining any of the organs.

On percussion the following conditions are noted: High position of the diaphragm, disappearance of liver dulness, and the usual percussion phenomena noted in all cases of ascites. Vaginal examination shows a sinking of the cervix and vaginal vault, and in marked cases the uterus and adnexæ are not palpable.

INTERMEDIARY FORM. Between the exudative and dry form of peritonitis there is a transitional or intermediary form, consisting of encapsulated fluid, which gives the same physical signs as other cystic collections in the abdomen.

DRY FORM. The dry form of peritonitis manifests itself as a localized or general process; the omentum may alone become hypertrophied, but in other instances the intestine and mesentery are also involved. The differential points of diagnosis in these cases are, first, the pain

which accompanies the dry peritonitis, and second, the dulness on superficial, and tympany on deep percussion.

Fever is observed in a large number of cases. When present it must always be considered as a sign of progression in the disease.

Treatment. Merkel's concluding remarks concerning the method of operation are of especial interest to me, for they coincide with our observations in a considerable series of cases in the Johns Hopkins Hospital clinic. According to him, a simple exploratory incision is quite as efficient from the therapeutic stand-point as the extensive irrigations with antiseptic fluid, introduction of iodoform, or the extirpation of ovaries, uterus, or lymph-glands.

To do away with abdominal section Mosetig and Nolen have performed a simple paracentesis abdominalis, followed by the inflation of air into the peritoneal cavity; but as they have only operated upon six cases it is impossible to draw conclusions as to the results of this method of treatment.

It is a great satisfaction to know that the exploratory incision is not merely palliative, but is actually curative. Nüsslein has demonstrated the healed process in twelve autopsies, while Bumm, Jordan, Nanotti, Gatti and others have attained very satisfactory results in animal experimentations.

From the clinical stand-point Aldibert reports a permanent cure in 70 per cent. and König in 65 per cent. of cases.

Prognosis. The prognosis is most favorable in the dry form, next so in the ascitic, and worst in the purulent forms of the disease. Concerning the healing factor in these cases, the theory of Bumm, of Basel, is, perhaps, the most worthy of acceptance, for it is based upon careful experimentation and clinical observation. He lays especial stress upon the necessity of carefully sponging out the abdomen and drying the peritoneal surface. Through this mechanical irritation of the peritoneum he believes a reaction is induced which causes a retrogression and final healing of the tubercular process.

Another case of healed tuberculosis of over eight years' standing is reported by J. Schramm.¹ In this paper the author criticises the reports of so-called cases of healed tuberculosis, because in many instances no positive microscopical evidences of the character of the disease was made at the time of operation. In view, however, of the strongly characteristic macroscopic appearance of tuberculosis of the peritoneum, I believe we may accept the clinical diagnosis made by an exploratory measure as correct in the majority of cases.

In my own experience I have never seen a clinical diagnosis of peritoneal tuberculosis proved incorrect by microscopical examination.

¹ Archiv. für Gynec., Bd. 56, p. 47.

There are practically only two other pathological conditions (carcinoma and papilloma peritonei) which may be mistaken for it. A very limited study of the post-mortem appearance of each of these diseases, however, will quickly set one right in the clinical diagnosis, for rarely is a case found which does not present marked differential features which leave no doubt as to its true nature.

Such reports, therefore, as those of von Rogowicz¹ of 313 cases, of von Routier,² and of Thomas³ of 379 cases, in which a large percentage of cures are reported, may be taken with considerable assurance of their correctness.

RETROFLEXION OF THE UTERUS.

Since the days when the Hodge pessary obtained its worldwide reputation in the treatment of retroflexio uteri, innumerable modifications of this pattern and various uterine supports have been suggested, which have usually given far more notoriety to their inventors than relief to the afflicted patient.

After the medical world had recovered from the first wave of popular enthusiasm, like that which follows the introduction of every new remedy of good promise, and had settled into a calmer judgment of the therapeutic merits of the various mechanical supports, it was found that many cases, in fact a considerable percentage, were not relieved, and that a small number were actually made worse by their employment.

At this juncture the operative gynecologist made his début, and through his fertile genius numerous surgical operations were introduced which promised to supplant entirely the treatment by pessaries.

The chief dangers attending these variations of opinion are that increased risks and suffering are entailed upon the patient, and that students who enter medicine while the attention of the profession is largely engaged with the more radical departures become more or less prejudiced in their favor at a time when their medical judgment is immature, and consequently are prone to look askance at the older methods of treatment.

For this very reason I venture to say that but few graduates in medicine of the last half decade will ever acquire the *finesse* , like that possessed by a Hodge, a Thomas, a Sims, a Peasley, a Goodell, an Emmet, or many of their students, of introducing a pessary. The men, therefore, who are capable of judging honestly, but not too narrowly, the many

¹ Jahresbericht f. Geburtsh. u. Gynäk., Bd. vii.

² Péritonite Tuberculeuse. Ann. de Gyn. et d'Obst., tome 40.

³ Beiträge zur operativen Behandlung der Tuberculosis peritonei. Inaug. Diss., Leiden, 1896.

innovations in medicine, and who hold to the old principle until the new is proved correct, are, after all, the safest teachers.

In an exceedingly clever little booklet presented to his guests at a dinner given by Prof. Sänger, of Leipzig, during the session of the Seventh German Gynecological Congress, in 1897, the professor gives sway to the muse, under whose influence he narrates in rhyme the woes of the retroflexed uterus, and although his verses are characterized by happy witticisms and satirical humor, they nevertheless conceal between their lines a deal of wholesome thought and protest against the extent to which the operative treatment has been carried by the over-zealous gynecologist. His introductory verse, entitled "Uterus Quidam Retroflexus," offers the protest of the unoffending uterus which desires to be left undisturbed, for it insists that whether it inclines toward the bladder or whether it rests upon the rectum is immaterial, inasmuch as both postures fall within its normal province. The German verse is as follows:

"Ach, liebe Leute, laszt mich liegen!
 Ich liege da so warm, so gut;
 Weshalb mich wieder vorwärts biegen?
 Ich lieg' auch so in besten Hut.
 Ob auf die Blase ich mich niege,
 Ob auf dem Mastdarm auf ich ruh';
 Aesthetisch ist es ganz das Gleiche,
 Mir kommen beide Lagen zu."

The poet then recites how the correct and conservative gynecologist insists upon the uterus assuming a mobile posture, inclined gently forward upon the bladder, and in case of refusal resorts to discipline and forces it into a proper position with a Hodge pessary.

Then comes the plea of the uterus, fixed by adhesions to the rectum, to be released and restored to its resting-place upon the bladder, which is answered both by Thure Brandt, who proposes to liberate it by massage, and by B. S. Schultze, who would by forcible bimanual manipulation break up the adhesions and accomplish in a moment the results obtained only through many weeks of treatment under Brandt.

From this strain the poet turns to consideration of the various pessaries, and terminates with the line that a Hodge, a Thomas, or a figure-of-eight form is of equal value, provided "it fits." At this point the modern gynecologist has his say, and proposes to discard the antiquated pessary, which at best he considers but a makeshift and always inferior to *fixation*.

Each operative method is then passed in review, and the poet terminates with the verse that neither the conservative gynecologist, who would leave the uterus alone, nor the advocate of the pessary, nor those who, through the aid of sutures, would fix the refractory organ either above, below, forward, or behind, nor the decision of the Gynecological

Congress, and finally not even the poet himself, can foretell how much further the strife over the question may go.

Before that congress had passed its third sitting the poet's verses had been verified, for in the discussion following the announcement of the first principal theme, "*Retroflexio Uteri*," it became quickly evident that there was a wide divergence of opinion as to treatment, and that even among the wisest heads there was a lack of consensus which neither appeared desirable nor possible after the many years of treatment by the various methods and the volumes of literature devoted to the various aspects of the subject.

The same lack of agreement, I think, exists in this country, but to a less extent, for here the operative method of treatment is practically confined, in the hands of the best operators, to two methods: suspension of the uterus to the anterior abdominal wall, and shortening of the round ligaments; the vaginal and vesical fixation methods have, fortunately, never come into vogue.

As the literature of the two continents is more or less distinctive, I propose to consider it under two headings: First, European views relative to *retroflexio uteri*, and second, American views relative to *retroflexio uteri*, and follow these by a critical analysis of the various opinions and my own conclusions concerning the principles which I feel justified in accepting.

In view of the fact that the views held by the Germans were quite generally expressed at the Seventh Gynecological Congress, held in 1897, I shall quote the essential points brought out in the leading papers and subsequent discussion, assuming that this will, with possibly a few exceptions, conform to the latest views on the subject. A consideration of the views held by the Americans, as expressed in a number of good recent publications, will then be given.

European Views Relative to *Retroflexio Uteri*.¹ SCHULTZE'S VIEWS ON THIS CONDITION. The first principal in the discussion of the theme, "*Retroflexio Uteri*," was Prof. B. S. Schultze, of Jena, who has done such splendid original work in the gross anatomy of the female pelvic organs and is famous for his successful overthrow of the false ideas of anatomists, established and defended by Henle, of the normal posture of the uterus. It was with no little interest, therefore, that I heard him present his theories, many of which are now established fundamental principles and are incorporated in every text-book.

In view of the general acceptation of Schultze's theories I shall merely epitomize his remarks and quote his more important conclusions in order to give a clearer understanding of the present status of this

¹ Verhand der Deutsch. Gesellschaft f. Gynäk., 1897, vol. vii.

much-discussed question. As the chief points in the etiology of retroflexion he gives the following :

1. Relaxation of the normal supports of the uterus, a disposition to which may be induced (*a*) during pregnancy or the puerperium, (*b*) through absorption of the inflammatory products of parametritis posterior, (*c*) habitual overfilling of the rectum, (*d*) continued dorsal posture, especially if associated with abdominal compression in this posture.

2. Fixation of the cervix further forward than normal through (*a*) scars resulting from anterior parametritis, (*b*) scars from high cervical lacerations or from unclean dissection or other operations upon the cervix, (*c*) scars filling cavities made through loss of tissue incident to gangrene anterior to the cervix, or from the presence of a vesico-utero-vaginal fistula.

3. Too short vagina, especially shortness of the anterior wall as a result of (*a*) deficiencies during the embryological development, or (*b*) from senile atrophy.

4. Habitual distention of the bladder.

5. Relaxed vaginal outlet.

While these are enumerated as the chief causes, the following may also occasionally lead to the same result :

6. Abnormally long portio-vaginalis.

7. Tumors in the anterior wall of the uterus.

8. Myomata of the anterior cervical wall which have been extruded into the vagina.

9. Deficient descensus ovariorum (Küstner).

10. Posterior adhesions of an ovary or tube through inflammatory process. Subsequent shrinking of the exudate may draw the uterus backward into retroflexion (Küstner's observations).

11. Growth of ovarian tumors.

Concerning the last cause Schultze is in doubt.

In the line of prophylaxis he advised the following conditions to be guarded against: Distention of the bladder, especially in children and half-grown girls, and also when the vagina is short; parametritis in virgo intracta, resulting from catarrhal endometritis which, in turn, is to be prevented through the wearing of suitable clothing and the employment of aseptic pads during the menstrual flow. Perineal tears occurring during parturition, even if small, should be repaired immediately or later if detected during a gynecological examination.

The greatest care must be observed during the lying-in period to prevent constipation, for the dislocation of the cervix induced through this means offers an excellent opportunity for the action of the intra-abdominal pressure in pushing the uterus into retroflexion, especially while the woman occupies a dorsal decubitus.

As would be expected from the gynecologist who has lived through the entire era of pessary treatment, and has had much to do with its promotion, Schultze takes a conservative position and inclines toward the older method, but only advises it when there is no complication which prevents the replacement of the uterus by ordinary bimanual manipulation.

On account of its pliability he prefers a celluloid pessary which may be moulded into a Hodge, a Thomas, a figure-of-eight, or a sled-form, depending upon the exigencies of the case. Following the instructions relative to the introduction of the pessary Schultze details the well-known rules concerning the subsequent care and observation of the patient.

With regard to a permanent cure, which, after all, is the most important question to the patient and also to the physician whom she consults, he says the prognosis is good if the retroflexion is not of long standing, and even in the latter event is favorable if pregnancy followed by abortion or delivery at term has occurred shortly before the patient has applied for treatment.

Complications which frequently disappear after the proper application of a pessary are deficient involution, metritis, endometritis, and oöphoritis, if not of too long standing, while such minor ills as pain and swelling of the ovary are always relieved.

When the inflammatory complications are more or less chronic a preliminary curettement of the uterus often serves a useful purpose in exciting a healthy contraction in the muscular and ligamentary tissues.

When hinderances to reposition are induced through peritoneal adhesions they should be broken up by bimanual manipulation under ether, and the uterus brought forward and held in place with a pessary or tamponade.

A Thomas pessary, however, should not be employed to correct the deformity, for it may push the peritoneum lining Douglas's pouch up against the raw area existing at the point where the adhesions have been released and lead to a recurrence of the same complication. Under the heads of hinderances to reposition and to retention of the uterus he considers the many inflammatory and other anomalous conditions which may play these rôles.

For a satisfactory action of a pessary an uninjured pelvic floor is desirable.

If there is coincident relaxation of the vaginal outlet Schultze advises its repair, and of late years he performs at the same sitting a vaginofixation or vesicofixation or an Alexander-Adams operation.

OSHAUSEN'S SUMMARY OF SYMPTOMS. The one man in Germany whose name has been most prominently associated with the operative

treatment of retroflexion, and yet may be classed among the conservative advocates of operation, is Olshausen, of Berlin, who almost simultaneously with Kelly in this country introduced a ventro-fixation operation. While Olshausen naturally favors the latter operation, he is, nevertheless, quite liberal in his judgment of other methods, and we may accept, therefore, with considerable assurance anything he may have to say upon the subject.

His discussion before the German Congress was clear-cut and explicit, and his résumé of the symptomatology and therapy of retroflexio uteri is worthy of close study. The main points of his discussion are concentrated in the following outline :

1. Symptoms attending cases of retrodeviation complicated with tumors of the adnexæ cannot be considered in the study of symptomatology, for they usually arise from the complications.

2. Uncomplicated cases of retroversion and retroflexion produce no especial difficulty in probably 50 per cent. of cases, and especially noteworthy is the fact that local symptoms referable to the deformity are frequently absent. Notwithstanding this fact Olshausen warns against undervaluing the reflex symptoms which may arise from the retroflexion and yet be attributable to other sources. A point to which he calls attention is that cases not infrequently occur which, although they may continue months and even years without discomfort, may at last produce ill effects.

3. A relatively large proportion of cases gives rise to symptoms which may become exaggerated ; of these the most constant are sacral pain, headache, dragging sensations, decreased ability to walk, changed disposition, constipation, and dysmenorrhœa. Numerous symptoms which are undoubtedly dependent upon the retroflexion may occur in all regions of the body.

In old cases of retroflexion, menstrual disturbances occur only as a too early or too abundant flow, while atypical or persistent bleeding is common to very early cases of puerperal retroflexion.

If the flexion is of long-standing and the latter symptom arises, it indicates with certainty some complication, usually an endometritis fungosa.

5. An infrequent direct result of the flexion is sterility. This condition is, as a rule, induced through diseases of the appendages or a high grade of hyperplasia uteri.

6. Abortion is not infrequently the result of retroflexion. Spontaneous replacement of the uterus occurs, however, in the majority of cases and the pregnancy goes on without interruption to its full term. In other cases habitual abortion occurs in the second or third month (*abortus habitualis*).

In other cases abortion and normal labors are irregularly interchange-

able. The uninterrupted continuation of pregnancy depends to a certain extent upon the form of the sacrum; if it is deeply hollowed spontaneous reposition is rendered difficult on account of the hinderance opposed by the sacral promontory.

In considering the predisposing causes to abortion the condition of the uterus must also be taken into account. If the walls are resistant and inflexible abortion occurs easily, whereas softness and pliability are conducive to the continuation of pregnancy to full term. The retroflexion may be overcome through a distention of the anterior wall, which tends to draw the uterus slowly or sometimes quite suddenly out of its retroflexed position.

According to Olshausen the views held by some writers concerning the reposition of the uterus through the action of the round ligament is not proved. At the most this occurrence is very exceptional. In cases where the reposition is very gradual a diverticulum is occasionally formed, or a partial retroversion persists even in the advanced pregnant uterus.

Under these conditions a miscarriage may occur in the sixth, seventh, or eighth month.

7. The dependence upon the retroflexion of the local and reflex symptoms noted under paragraph 3 is best proved by the results of treatment. If they are directly referable to the retroflexion the replacement and subsequent retention of the uterus in ante flexion, with a pessary, will cause the symptom to disappear not infrequently in from twelve to twenty-four hours. This is especially true of the head and stomach symptoms as well as of melancholic tendencies. If one or more of these symptoms which disappear with the reposition of the uterus, return later after treatment has been instituted, it is the best sign of a recurrence of the retroflexion.

8. Dysmenorrhœa is, as a rule, not a prominent symptom and never assumes the excruciating colicky-like character so frequently noted in the ante flexion of nulliparous women. The symptoms in rare instances arise from mechanical obstruction to the menstrual flow due to stenosis of the cervix. It often depends upon endometritis, and when of great intensity is most frequently induced through a metritis parenchymatosa.

If the metritis is of such a high grade that the uterus, in addition to its abnormal density and resistance, has reached a size two to three times greater than the normal, the dysmenorrhœa depends mostly upon the complication and, consequently, will persist after the reposition. Cases of long standing are especially prone to relapse.

This careful résumé of Olshausen leaves little to criticise and much to commend. His conservative views as to the infrequency of symptoms arising from uncomplicated retroflexed uteri should cause many

over-zealous operators to study their cases a little more closely before subjecting them to operative treatment.

The point which he makes concerning the persistence of dysmenorrhœa in cases where there is, in addition to an endometritis, an extensive parenchymatous metritis, is especially good, for it is this class of patients who are the most persistent visitors to our clinics and, notwithstanding the application of every method of treatment short of actual removal of the uterus, continue to suffer through months and years.

OPERATIVE TREATMENT AS SUMMARIZED BY OLSHAUSEN. 1. Operations for the correction of retroflexions should be resorted to only in those cases which give rise to marked symptoms. As a rule, even in these cases, if the uterus is mobile, the value of the pessary should first be tested. The fact that the patient may live a long distance from her physician, or other circumstances of her life, may render this course inadvisable.

2. The adoption of an operative course of treatment depends upon the age of the patient. For women who are near or are within the climacterium, operation is not advisable, for their symptoms are usually insignificant at that period, and will disappear when it is well passed.

3. Cases of retroflexio uteri associated with disease of the ovaries, palpable exudates or wide-spread adhesions, as a rule, suffer more from these complications than from the retroflexion. In such cases the operative treatment naturally depends upon the character of the complication. Frequently after the diseased adnexæ are removed it may be advisable to release the uterus from its adhesions and retain it in a new position by ventro-fixation, if one does not prefer the total extirpation of the uterus per vaginam.

4. The operative treatment of simple retroflexion (fixed and mobile) has been employed to a most unjustifiable extent.

It cannot be denied, however, that the safety with which the vaginal and abdominal operations may be conducted, in case infectious matter does not already exist in the pelvis, justifies a more extended operative treatment than formerly.

5. The dangers from operation in the simple cases and in those complicated by infectious disease (pyosalpinx) are almost the same, whether the vaginal or abdominal method of operation is employed.

6. Of the operative measures the following are to be considered :

a. The Alexander-Adams operation.

b. The ventro-fixation operation.

c. The vagino-fixation operation.

d. The vaginal shortening of the sacro-uterine and the round ligaments.

a. The Kocher and other modifications of the Alexander-Adams

operation appear to be quite effectual in their results, and, according to Olshausen, deserve wider attention in Germany than has hitherto been given to them. The difficulty of finding the round ligaments when the abdominal wall is very fatty prevents most operators from employing these methods. In cases of adherent retroflexed uteri shortening of the ligaments is not effectual.

b. Ventro-fixation, properly carried out, is as free from danger as its results are certain. When the uterus is adherent it is the best method of operating. In the fixation only the cornu uteri should be attached by means of the round ligament to the abdominal wall. This method insures mobility of the uterus and the proper yielding of the abdominal attachment during pregnancy.

The method of Czerny, by means of which the entire face of the uterus is sutured to the abdominal wall, is to be condemned, for it will either lead to a miscarriage or a very complicated delivery at term.

c. The vagino-fixation is not, as frequently stated, an exploded operation, for the bad results, especially the disturbances during parturition, are attributable, not to the operation *per se*, but to the way in which it has been performed. The uterus should not be anchored by the fundus to the vaginal wall, but by one or two silkworm-gut sutures inserted just above the internal orifice of the uterus.

It is not necessary to throw the uterus into marked anteflexion, a simple anteposition being all that is necessary to relieve the symptoms. That the vesico-fixation method is an improvement over the original vaginal method is certainly not proved. *A priori*, it is improbable that the attachment of the uterus to the vesical peritoneum will be a permanent one.

For all cases of retroflexed adherent uteri no form of vaginal operation should be chosen.

d. The shortening of the sacro-uterine ligaments by the vagina must be looked upon as the most rational treatment, since the relaxation of these structures is the predominating cause for retroflexion. The future, however, must teach us whether, and in what way, the shortening of the ligamenta sacro-uterina and ligamenta rotunda may be effectually accomplished *per vaginam*.

The operative methods which have for their object the obliteration of the Douglas pouch must be discarded.

According to the reviewer's opinion, Olshausen's advice concerning all of the principal methods of operation is good, with the exception of that relating to the vaginal methods, which he considers very questionable.

WINTER'S VIEWS ON SYMPTOMATOLOGY. Winter, of Königsberg, strikes a very essential point in endeavoring to settle the question of what symptoms, if any, actually arise from faulty positions of the

uterus. On one side Schultze attributes numerous serious difficulties to this cause, whereas Theilhaber, to whose work I shall refer later, absolutely disclaims any injurious effect from simple incomplete retroflexions of the uterus.

With such diametrically opposing statements from two men of recognized standing in Germany, Winter naturally asks, "Where does the truth lie?" In order to answer this question he has, quite properly, not resorted to the study of the patients applying to the gynecological clinic for treatment, but has collected very careful statistics from obstetrical patients who, through his direction, have returned from two to ten months after their confinement for examination. In the course of a year he saw 302 women, 36 of whom had some form of retroflexion. Of these, 11 were absolutely free from any discomfort. In order to determine as accurately as possible the cause of the symptoms, Winter made the most careful examinations, taking into especial consideration inflammatory conditions of the uterus (endometritis and metritis), of the appendages, and of the parametrium. Associated pathological conditions and changes in position of the vagina, disease of the bladder, stomach and intestines, and the mobility of the kidney were also closely studied. As a result of this analysis only four uncomplicated cases were found; of these one was a neurasthenic, who complained of pain in all organs, while another, who was nursing her child, suffered from sacral pain which, however, disappeared when her baby was weaned. The remaining two were subject now and then to pressure symptoms. In not a single instance could Winter convince himself that the faulty position had anything to do with the associated symptoms. Excluding these four, twenty-one cases remain to be accounted for.

The complications in these cases were as follows: 1 case of double disease of the appendage, associated with tumor; 1 case of perioöphoritis, oöphoritis, and perimetritis; 1 case of chronic coccygodynia; 2 cases of descensus vaginalis; 1 case of acute parametritis; 15 cases of subacute and chronic forms of parametritis.

The symptoms complained of by these patients were without exception due to the above-named complications.

One of the most astonishing statements in the entire discussion is, that of the thirty-six cases of retroflexion (simple and complicated), only two had any sort of menstrual derangement, and they only complained of a somewhat increased flow after the confinement.

From this analytical study Winter reaches the conclusion that "No recent case of retroflexion gives rise to symptoms." In order to confirm this observation he approached the subject in another way, by examining carefully all cases of retroflexion (90) which came to the polyclinic for treatment, in order to discover, if possible, the source of the symptoms.

After carefully following the course of these cases for six and eight months, with frequent control examinations, Winter reached the somewhat surprising result of finding only six uncomplicated cases in the entire 90. Of the 84 complicated cases, 6 were pregnant, 5 were troubled with puerperal hemorrhage, 6 had prolapsus uteri, 15 had disease of the mucous membranes, 31 had perimetritis and diseases of the appendages, 18 had parametritis, and 3 had more seldom complications.

In answer to the question of whether the retroflexion was originally the cause of the complication, Winter gives a positively negative answer. Concerning the symptoms of menorrhagia, dysmenorrhœa, sterility, and tendency to abortion, which are so generally considered as symptoms of retroflexion, he says: In the 90 cases, 23 suffered from excessive bleeding; but in only 4 instances was he convinced that the simple retroflexion had anything to do with it, the cause usually being attributable to the complications. While he does not entirely exclude retroflexion as a cause of abortion, he feels that its action is very limited.

This report of Winter is clearly revolutionary in its scope, and if his and Theilhaber's views are correct concerning the limited influence exercised by retroflexio uteri in producing symptoms there can be no further doubt but that by far too many retroflexion operations are being performed at the present time.

CONSERVATIVE VIEWS OF THEILHABER. Theilhaber, of Munich, states quite positively that the abnormal position of the uterus is not the cause of the symptoms, for the so-called pathognomonic symptoms of retroflexion—the bleeding and sacral and abdominal pain—are no more frequent in retroflexio uteri than when the uterus occupies a normal position.

In proof he gives a most interesting statistical study of his cases, which, if correct, goes far toward settling the point upon which he so strongly insists.

In one year 100 women with normally lying uteri were seen, who gave the following history:

	Per cent.
Menses were normal in	72
Menses were profuse, lasting six to eight days, in	11
Menses were over eight days in duration in	4
Atypical bleeding in	13
Sacral and abdominal pain in	31
Atony of the intestine in	42

In the same year thirty-three women with retroflexion consulted Theilhaber and gave histories as follows:

	Per cent.
Menses were normal in	57.5
Menses were profuse, lasting six to eight days, in	24.2
Menses were over eight days in duration in	6.1
Atypical bleeding occurred in	12.2
Sacral and abdominal pain in	36.2
Atony of intestine in	54.5

A further comparative study by Theilhaber of a large number of cases during the years 1894, 1895, and 1896 demonstrated the fact that sacral and abdominal pain, intestinal atony, and disorders of menstruation are approximately the same in patients with normal and with retroflexed uteri.

Of 423 patients studied by Freudenberg, in Landau's clinic, he found practically as many suffering from the above-mentioned symptoms with normal as with abnormally posed uteri.

As a result of Theilhaber's observation, he came to the conclusion that the change in the position of the uterus is merely an accidental complication, and is, therefore, not responsible for the symptoms.

According to his opinion the so-called pathognomonic symptoms are the result of independent disease, such as chronic inflammation in the pelvis, chronic catarrh of the uterus, hysteria, neurasthenia, and intestinal atony.

DÜHRSSSEN'S RADICAL VIEWS. As a type of the over-zealous gynecologist whom Olshausen accuses of operating upon 100 per cent. of retroflexion cases, Dührssen stands as a representative.

The statement by Dührssen, that he has operated upon 281 cases between the years 1891 and 1897, in his private clinic, must cause one to pause for a moment and wonder if Olshausen's statement is not correct. Such statistics as these, compared with the largest gynecological clinics of this country, lay this very active gynecologist open to the suspicion that not only 100 per cent. of cases of retroflexio uteri, but a considerable percentage of other uteri, are being subjected to the vaginal operation in his clinic.

Dührssen, however, disclaims Olshausen's accusation, but admits that he operates upon from 33½ to 50 per cent. of cases.

That his first method of operating by vaginal fixation of the uterus is a failure is proved by the fact that he has discarded it and now anchors the uterus by suturing the round ligaments in the vaginal incision. By the latter method he claims that his results are better than by the older method. From the many bad sequelæ scored against the old method, it is certainly to be hoped that better results have followed the second operation. As Dührssen now performs his operation the anterior vaginal fornix is opened by a T-shaped incision, a sagittal incision is then made in the vesical plica sufficiently large to permit the uterus to be delivered into the vagina, after which the round ligaments are caught one after the other with silkworm-gut sutures, and fastened in the vaginal wound. After replacing the uterus the peritoneal and vaginal incisions are separately closed.

Dührssen admits that in sixty cases of adherent retroflexed uteri the vaginal method was much more difficult than the abdominal, but offers

as his excuse for performing it that the danger of ventral hernia was thus avoided.

I am certain the best American operators would consider the disadvantages of this operation as far outweighing the possible advantage of avoiding an abdominal hernia. In fact, with proper methods of suture there is practically no risk from post-operative herniæ.

The occurrence of this sequel in such a simple operation as suspensio-uteri, where the abdominal incision is so small and the chances for infection very slight, would unquestionably be a reflection, except in the rarest instances, upon any surgeon.

Then, too, the occurrence of two deaths from hemorrhage, which Dührssen reports, is not an enviable record, for such accidents do not follow the abdominal operation in the hands of a skilled surgeon. Without going beyond Dührssen's own argument in favor of his operation, I think it can unhesitatingly be condemned.

BAUMM'S VIEWS UPON OPERATIVE TREATMENT. Baumm, of Breslau, in discussing the various methods, said he had tried first the Schücking, then Stratz's obliteration of Douglas's sac, and finally Fromel's and Sänger's operations, without satisfactory results. At first he looked upon the Alexander-Adams operation with great favor, but had finally abandoned it for the following reasons: Unsightly inguinal scars, difficulty of finding ligaments, and finally on account of the fact that the operation was only satisfactory when the uterus was mobile.

From the Alexander-Adams operation Baumm turned to the Mackenrodt-Dührssen vagino-fixation method, which he has found most satisfactory. The bad results attributed to this operation have, according to this speaker, been due to a too high fixation of the fundus. He says in hardly any other operation does so much depend upon an exact technique.

The statement that the "latitude between too little and too great is slight, and it requires, therefore, practice and experience to strike the right point," is, instead of being commendatory, strongly condemnatory, for when we consider the fact that the too little means a recurrence of the retroflexion, and the too much, dangerous sequelæ and disturbances in case of pregnancy, one can unhesitatingly say that such an operation is entirely too risky for a comparatively simple condition like retroflexio uteri.

VAGINAL SHORTENING OF THE ROUND LIGAMENT. Wertheim, of Vienna, who simultaneously with Bode, of Dresden, introduced the method of shortening the round ligaments by the vagina, spoke of the results obtained up to the time of the Leipzig Gynecological Congress.

His incentive to this modification of the original Mackenrodt-Dührs-

sen method was the unfavorable influence of the latter upon parturition. That the method is worthy of consideration is proved by the fact that Dührssen himself has adopted it under the name of a modification.

Wertheim claims for the operation as good results as those obtained from the Alexander-Adams operation, and the additional advantage of being more easily performed. In ten cases operated upon by him there had been no recurrence of the retroflexion. In reply to Olshausen's objection to the vaginal operation in adherent retroflexed uteri, Wertheim says this is no contraindication, for in no instance has he been forced to resort to the abdominal method. Upon this point, however, it seems to me that he speaks without sufficient experience, for while he may have operated upon ten cases successfully, the eleventh might present very great difficulties. A judgment as to the safety of the operation should, therefore, be held in abeyance until a larger number of cases have been reported. His method consists in :

1. Opening of the plica vesico-uterina.
2. Replacement of uterus by simultaneously pushing the portio vaginalis backward and pulling forward the fundus by the aid of a tenaculum forceps.
3. Exposure of the uterine cornu through the assistance of a second forceps. After the round ligament is brought into view a traction ligature is thrown about it.
4. Exposure of opposite uterine cornu in the same way.
5. Shortening of the round ligaments 8 to 12 cm., depending upon circumstances, through the formation of folds which are lightly sutured with silk.
6. Closure of the plica vesico-uterina and the vaginal wound.

VIEWS OF VARIOUS OTHER GERMAN GYNECOLOGISTS. Veit, of Leiden, employs a pessary in the majority of cases ; when this treatment is not available he resorts to the Alexander-Adams operation if the uterus is mobile, otherwise he performs ventro-fixation.

Fehling, of Halle, first employs the pessary, and only after this fails does he resort to operation. For some time he did the ventro-fixation operation as advised by Olshausen, but, through fear of hernia and the other dangers attending cœliotomy, he gave it up and now does the vesico-fixation operation.

Küstner, of Breslau, resorts first to the use of the pessary, and when this fails he performs the Alexander-Adams operation for mobile uteri and for those fixed by adhesion the ventro-fixation method. This speaker had seen a patient in labor with the uterus densely fixed to the anterior abdominal wall, and yet the delivery was spontaneous.

Kehrer, of Heidelberg, employs first the pessary, and in case this fails shortening of the round ligaments.

Löhlein, of Giessen, advises a *noli me tangere* policy as far as possible in young women, in women past the menopause and in women with adherent retroflexed uteri, where there is neither pain nor pressure nor a tendency to a further sinking of the uterus in the pelvis.

Martin, of Berlin, performs the vagino-fixation operation.

Mackenrodt, of Berlin, spoke of his vesico-fixation method, which corresponds in its general principles to the method described by Dührssen. His advice, notwithstanding the extreme opposition of many speakers and writers, was radically in favor of the operation.

One of the level-headed gynecologists of Germany, whose calm judgment is generally recognized and respected, said, on hearing Mackenrodt's discussion, "He dies hard."

Fritsch, of Bonn, employs palliative methods and treatment by pessaries if the woman can afford the time and money, otherwise he performs the ventro-fixation operation. He is afraid of vagino-fixation on account of the vesical pain, dyspareunia, and other complications which may follow it. He thinks the Alexander operation of the greatest value if its results are permanent.

Leopold, of Dresden, employs ventro-fixation, but warns against the too close suturing of the uterus against the anterior abdominal wall.

Von Rosthorn, of Prague, gave a most instructive statistical record of cases, as follows: Of 6722 persons who visited the Prague gynecological clinic during a period of five years there were 1094 cases of retrodeviations of the uterus, (16.2 per cent.). Of these, 902 were cases of retroflexio mobilis; 192 were cases of retroflexio adherens; 295 cases were coincident with prolapsus; 21 cases were accompaniments of general enteroptosis. Complications were observed as follows:

	Per cent.
Endometritis	43.0
Metritis (excessive)	8.0
Elongation of the cervix	7.0
Laceration of cervix	2.0
Salpingo-öophoritis	7.0
Myoma-uteri	2.2
Pregnancy	2.0

In the way of treatment Von Rosthorn has been quite liberal in his acceptance of new methods, for he has evidently tried them all. For the adherent retroflexed cases he has employed Schultze's forcible rupture of the adhesions for the purpose of correcting the reposition; of 96 cases 18 per cent. relapsed. As a warning, he says the greatest care should be employed in the manipulation, for it is by no means free from danger.

In one case he forcibly pushed his finger through the vaginal vault, and in a second instance ruptured the rectum. Both injuries were imme-

diately repaired, and, fortunately, beyond the immediate mishap no further ill result followed. In 199 cases the uterus was replaced and retained in position by various models of pessaries. Twenty-seven cases were cured by massage, 82 cases were subjected to operation, 34 to ventro-fixation, and 48 to vagino-fixation. The cases of retroflexio uteri in which the suspension operation was employed were either adherent or associated with diseases of the appendage.

With regard to the Alexander-Adams operation, Von Rosthorn says, that notwithstanding an extensive experience in finding the round ligaments in his operative course upon the cadaver, in his first operation upon the living subject he utterly failed and was compelled to abandon the attempt.

This failure so prejudiced him against the operation that he has never since attempted it. The splendid reports of Werth and Kocher, however, have so far reassured him that he does not doubt but that he will again try it.

Although he has employed the Wertheim method of shortening the round-ligaments he does not feel safe in passing judgment upon it, for in five cases there were three relapses. As the speaker quite reasonably explained, the bad results may have been due to failure on his part to carry out the technique properly, rather than to inherent defects in the method.

Chrobak, of Vienna, was especially outspoken in his recommendation of the pessary, claiming that the physician who possesses the requisite skill and judgment, and persists in its application, will usually accomplish a successful result and will very seldom be forced to an operation.

As a proof of his conservative views he states that only 51 cases up to that time had been subjected to operation in his clinic, an astonishingly small number when we consider the large number of cases annually admitted to his service in the great Vienna hospital.

The operation advised by Chrobak is ventro-fixation as performed by Olshausen, this being the surest method when there are adhesions. Concerning vagino-fixation, he has seen good results and bad results, the latter being of such a serious nature in some cases as to cause him to look with no little misgiving upon the operation.

Pfannenstiel, of Breslau, spoke enthusiastically in favor of Wertheim's method of vaginal shortening of the round ligaments. He had employed it in fifteen cases coincidently with a plastic operation for prolapsus, and in no instance had he experienced any difficulty in its performance, and so far there had been no recurrence.

For the unmarried or nulliparous married woman he advises the Alexander-Adams operation, reserving Wertheim's method for those cases in which a plastic operation upon the vagina is also performed.

American Views on Retroflexio Uteri. So far as the etiology of retroflexio uteri is concerned, the opinions held by American gynecologists are largely derived from the work of such distinguished pioneers as Hodge, Sims, and especially Emmet. The principles enunciated by these distinguished workers have been, of course, considerably elaborated from time to time. That they are worthy of credence is proved by the fact that the evolution of this subject in Europe, as initiated largely through the researches of Schultze, has followed much the same lines. As our knowledge of this question is practically crystallized and has received no notable additions of late, it may be passed over without further comment.

Beyond this point, however, the various palliative and operative methods of treatment are under very lively discussion, but it is a pleasure to note that we have not run to the wide extent or engaged in such acrimonious disputes upon this subject as our German colleagues.

The sentiment in this country has been largely divided between two operative procedures: suspensio uteri and shortening of the round ligaments.

American gynecologists have never enthused over the various vaginal methods, which is an evidence of good practical judgment, for there is much more of discredit than of credit stored up against these operations.

While a little order has come out of chaos with regard to the vaginal operations, and as performed under the new modifications they may be safer, there are, nevertheless, still too many chances for disastrous sequelæ following the Dührssen-Mackenrodt method to make it an operation of election.

This sentiment has evidently been the prevailing one in the United States and Canada, for our literature has been very little burdened with extensive dissertations upon the vaginal methods and reports of cases, some favorable and many unfavorable, like those which have appeared in the German periodicals. Since the introduction of suspensio uteri by Kelly and Olshausen in 1886, the cases operated upon by this method have run up into the thousands. Smith, of Montreal, for instance, has collected the reports of 2500 operations performed by forty American gynecologists and surgeons. On the other hand, the correction of retro-deviations through shortening of the round ligaments has also had many warm advocates, of whom Edebohls, of New York, and Kellogg, of Battle Creek, have been among the leaders.

The reports concerning the ultimate results of this, and also of the suspension operation, had at best been merely fragmentary until the appearance of Edebohls' thorough résumé of the literature and his summary of the ultimate results as observed in 115 cases operated upon by himself. For the fullest consideration of all the details and points

which may come into question concerning the operation, the reader is referred to Edebohls' original article.¹

Edebohls' Method of Shortening the Round Ligaments. In the hands of Edebohls the technique of the suspension operation has gone through a considerable evolution, and from the thoroughgoing manner in which his final modification has been worked out we have every reason to believe that it is the most perfect of any of the modifications of the original Alexander operation.

The following full abstract of Edebohls' description is given, for condensation of his already clear description is not possible :

According to his directions "the most careful preliminary preparation of the patient in the way of purgation and cleansing of the abdomen is attended to the day before operation.

"Just prior to shortening the round ligaments the uterus is always curetted, and whatever plastic work upon cervix, vagina and perineum the conditions present in each case call for, is performed. If adhesions of the uterus and adnexa exist, and the operator prefers to sever these adhesions by anterior or posterior colpotomy, rather than by an incision from above, this is the proper time to do so. At all events, the operator must satisfy himself that the uterus can be well anteverted by bimanual manipulation before proceeding with the operation of shortening the round ligaments. The uterus is then allowed to assume any position it may please, generally dropping backward; to be brought into position at a later stage of the operation by traction on the round ligaments. A little iodoform gauze is loosely placed in the vagina, not to sustain the uterus, but as an antiseptic precaution in view of the preceding curettage. The field of operation is lathered and scrubbed with 10 per cent. creolin-mollin, rinsed clean with sublimate solution (1 to 3000), and the patient is ready for operation. In shortening the round ligaments the pelvis should be slightly elevated; the operator stands at the right side of the patient and begins the operation upon the left ligament.

"An incision 5 to 6 cm. long, and nearly parallel to Poupart's ligament, is carried from the site of the internal inguinal ring downward and inward, terminating just within the spine of the pubis. Careful location of the pubic spine, from the time of beginning the operation until the anterior wall of the inguinal canal is opened, is absolutely essential to success. The subcutaneous fat is divided until the glistening aponeurosis of the external oblique muscle is exposed. The superficial epigastric artery is frequently divided, and if so, should be ligated in this stage of the operation. The external inguinal ring is now either exposed to view or located by the touch. A grooved director is inserted

¹ "Shortening of the Round Ligaments," American Gynecological and Obstetrical Journal, December, 1896.

through the external ring and passed along the inguinal canal, directly behind the aponeurosis of the external oblique until its point is over the site of the internal ring. Cutting upon the director exactly in the direction of the fibres of the external oblique aponeurosis, one sweep of the knife lays open the anterior wall of the inguinal canal along its whole length (Fig. 38).

FIG. 38.

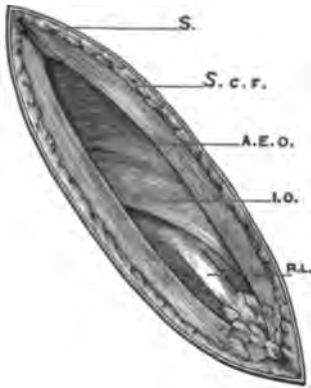


FIG. 39.

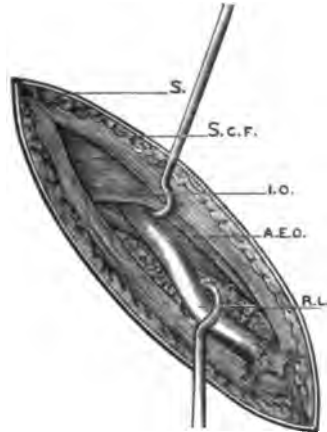


FIG. 38. Incision 5 cm. long, through aponeurosis of external oblique, laying open inguinal canal from external to internal ring and exposing internal oblique muscle and round ligament. The ligament is more or less concealed according to greater or less development of internal oblique. *S.*, skin; *s. c. f.*, subcutaneous fat; *a. e. o.*, aponeurosis of external oblique; *i. o.*, internal oblique; *r. l.*, round ligament.

FIG. 39. Isolating round ligament from its attachment in inguinal canal. *S.*, skin; *s. c. f.*, subcutaneous fat; *i. o.*, internal oblique; *a. e. o.*, aponeurosis of external oblique; *r. l.* round ligament.

“It is very desirable that all hemorrhage should be controlled before opening the inguinal canal, otherwise the flow of blood into the latter may render differentiation of the round ligament from the other contents of the canal exceedingly difficult. An assistant exposes the contents of the canal by drawing apart the lips of the incision through the external oblique aponeurosis, with the aid of tenacula, blunt hooks, or clamp forceps. The lower fibres of the internal oblique muscle are seen crossing the upper half of the canal, filling it more or less according to the great or less muscular development of the individual.

“In a fair proportion of cases the lower end of the round ligament is at once exposed to view, emerging from beneath the lower border of the internal oblique; more generally, the round ligament is well covered and entirely hidden from view by the internal oblique muscle and an investment of fatty, areolar and fibrous tissue. Quite frequently some of the fibres of the round ligament are so closely interlaid with those

of the internal oblique muscle that differentiation and separation of the ligament from bundles of muscular fibre become difficult. It is this part of the operation which generally trips the beginner; he fails to find the ligament, and cannot, of course, proceed. Experience has taught that the best method of procedure at this stage, if the ligaments are not at once exposed to view and recognized, is to search for them in the following manner (Fig. 39). Retract the internal oblique muscle upward and inward by a blunt hook passed beneath its lowermost fibres, and hand this hook to your assistant. Take two small blunt hooks, one in either hand, and sweep one of them, point downward and outward, along the posterior and outer walls of the canal from the depths of the wound skinward, hooking up the entire contents of the canal. By tearing these contents apart more or less, as required, by means of the two blunt hooks, the round ligament, surrounded by fat and muscular and tendinous fibres from the internal oblique, and accompanied by the ilio-inguinal nerve, will soon be recognized and can be followed along the canal to the internal ring. There the round ligament is always strong, however weak, thin, and frayed-out it may have been found lower down in the canal or at the external ring.

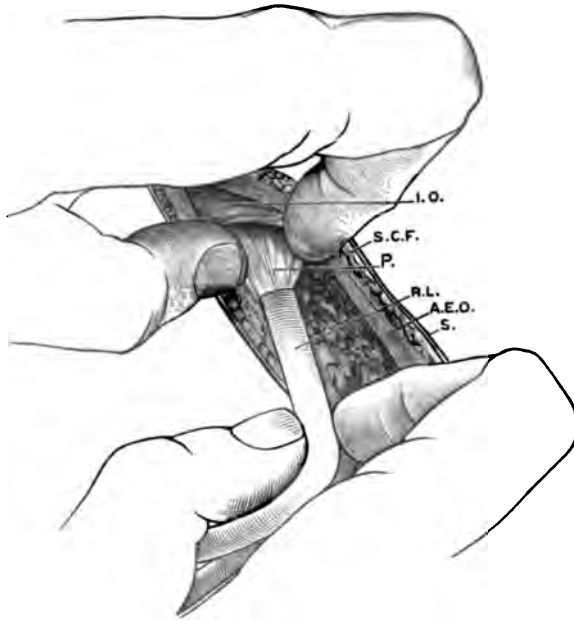
"The ligament is next separated from its investment in the canal, leaving, however, the pubic end attached for the present. In this part of the operation great care should be exercised not to divide or tear the ilio-inguinal nerve which accompanies the ligament, and division of which is the cause of the various dysæsthesiæ in the vicinity of the scar sometimes complained of by patients after operation. In the canal itself the ilio-inguinal nerve and the round ligament are very intimately connected; at the upper end of the canal they diverge, the nerve to pass between the muscular layers and the ligament to enter the internal ring.

"The ligament, freed from its surroundings in the canal, is next grasped by the thumb and forefinger of the right hand and cautiously drawn out at the internal ring (Fig. 40). The line of traction should be more or less perpendicular to the surface of the abdomen at that point, approximately in the direction of the intra-abdominal portion of the ligament. As the round ligament emerges at the internal ring it is seen to carry with it, in the form of an inverted cone, the investing peritoneum of the broad ligament, the point of reflection of the latter being marked by a distinct white line surrounding the round ligament. With the thumb and forefinger of the left hand the investing peritoneum is stripped or milked back into the abdomen as the round ligament emerges farther and farther from the internal ring. Occasionally the peritoneum tears in stripping it back; this is a matter of no consequence, provided the asepsis is all it should be.

"Should the ligament not run freely out of the abdomen, it will be

wise, before employing the limit of safe traction force, to ascertain the cause by incision of the peritoneum at the internal ring, bluntly dilating the latter, and passing a finger into the abdomen. If posterior adhesions prevent the uterus, tubes, and ovaries from coming freely forward, these may be separated by a finger or two, hooked behind the broad ligament; or if the infundibulo-pelvic ligament (as obtained in one of Edebohls' cases) be shortened and thickened as the result of previous inflammation, this ligament may be stretched. The round ligament will then be found to run freely, and the process of stripping back the peritoneum is continued until the index finger, passed down to the bottom of the wound,

FIG. 40.



Drawing round ligament out of abdomen and stripping back investing peritoneum of broad ligament; *i. o.*, internal oblique; *s. c. f.*, subcutaneous fat; *p.*, peritoneum; *r. l.*, round ligament; *a. e. o.*, aponeurosis of external oblique; *s.*, skin.

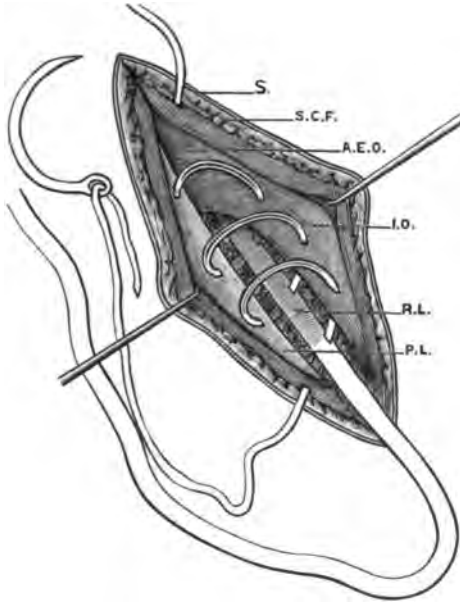
recognizes the impact of the cornu uteri at the internal ring when traction is made upon the round ligament." This constitutes Edebohls' index to the proper amount of shortening, which, expressed in figures, will average about 10 cm.

"The opposite round ligament is now sought, isolated, and drawn out in the same way. When free play of both ligaments has been secured, the anteposed fundus of the uterus may be drawn from side to side by altering traction upon the ligaments, the movements of the fundus being recognized by the operator's fingers placed on the abdomen immediately

above the pubis. In thin persons the transits of the uterus are frequently visible to the eye.

"Our next care is to properly reanchor the ligaments and close the wound. Thus far the ligaments have remained attached at their outer or pubic ends. These attachments are now cut for convenience in further manipulation, without, however, amputating any part of the ligament at present. After securing the desired position of the uterus by traction upon the round ligaments, and adjusting the latter nicely along the bottom of the canal, suture of the wound is in order."

FIG. 41.



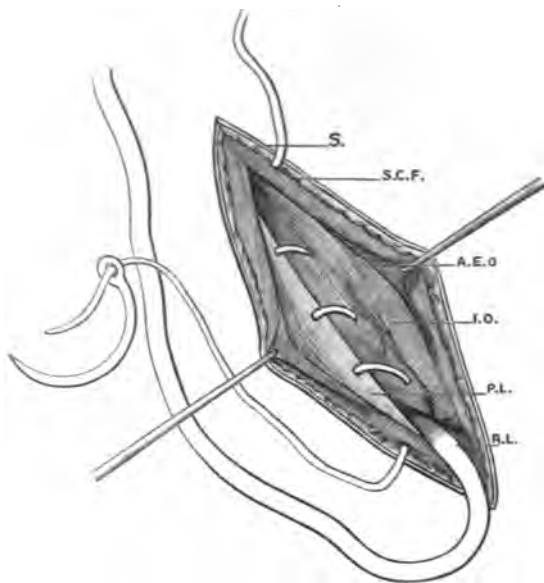
Deep tier of buried running suture of forty-day catgut embracing internal oblique and transversalis muscles, round ligament and Poupart's ligament. Deep part of uppermost loop of suture (not showing in cut) passes at level of and embraces margins of internal ring. *S.*, skin; *a. c. f.*, subcutaneous fat; *a. e. o.*, aponeurosis of external oblique; *i. o.*, internal oblique; *r. l.*, round ligament; *P. l.*, Poupart's ligament.

Edebohls' suture material for the deep parts consists of catgut No. 0, chromicized to resist absorption for about six weeks. A half-metre length of this forty-day catgut is threaded upon a full-curved Hagedorn needle of medium size or under. An assistant, with two tenacula, holds wide open the lips of the incision through the aponeurosis of the external oblique, so as to clearly expose the deep parts of the canal, and especially the clean-cut projecting shelf of Poupart's ligament.

"The parts are brought together after the principle of Bassini's operation for the radical cure of inguinal hernia, with the exception that

instead of the interrupted suture the buried running suture of forty-day catgut, applied according to the following technique, is used : Beginning at the upper angle and inner side of the right wound, the first sweep of the needle pierces the aponeurosis of the external oblique, the underlying internal oblique and transversalis muscles, the margins of the internal ring, the round ligament as it emerges between them, and the projecting shelf of Poupart's ligament. The succeeding loops of the deep tier of sutures, three or four in number, pierce the internal oblique and transversalis muscles, the round ligament, and Poupart's ligament. The last loop in addition penetrates the outer pillar of the external ring, and

FIG. 42.



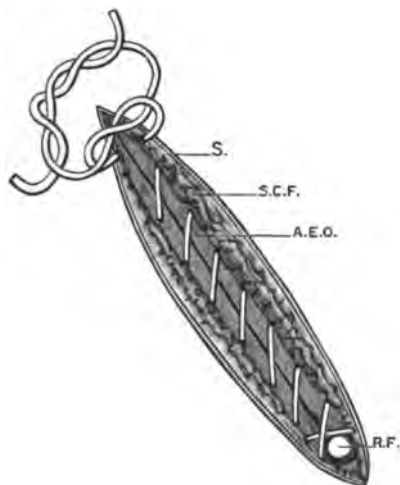
Deep tier of suture drawn home, obliterating inguinal canal. *S.*, skin; *s. c. f.*, subcutaneous fat; *a. e. o.*, aponeurosis of external oblique; *i. o.*, internal oblique; *P. l.*, Poupart's ligament.

emerges upon the outer surface of the external oblique aponeurosis at the lower end and outer side of the fascial wound (Figs. 41 and 42). A stitch is then taken, with still the same strand of catgut, piercing the internal pillar of the external ring, the round ligament, and the external pillar. The excess of round ligament is now cut away just outside of the external ring, leaving the stump to plug the ring (Fig. 43).

"After thus obliterating the inguinal canal and closing both internal and external rings, the same strand of catgut is continued upward as a running suture, uniting the lips of the incision in the external oblique aponeurosis and closing the anterior wall of the canal. At the upper

end of the wound the two free ends of catgut, emerging upon the aponeurosis of the external oblique, are tied together, forming the only buried knot. This knot, if carefully and tightly tied after the manner depicted in the figure—a single turn in the first half and a double turn in the second half of the knot—can be depended upon not to slip. The skin is nicely approximated over all by a subcutaneous suture of ordinary catgut, and the wound closed without drainage. Sterilized dressings applied over the wounds, and held in place by adhesive plaster and a double spica bandage, complete the operation.

FIG. 43.



Superficial tier of buried suture of forty-day catgut closing incision through aponeurosis of external oblique, restoring anterior wall of canal. The excess of round ligament has been cut away just outside of external ring. The part protruding through ring together with pillars of external ring pierced by lowest loop of superficial suture. Loose knot at upper end shows proper way of tying buried catgut knot to prevent slipping. Skin and fat to be closed over all by subcutaneous catgut suture.

“The dressing is changed, for the sake of cleanliness, at the end of a week. This second dressing is removed a week later, and the patient allowed to sit up. No pessary or support of any kind is worn at any time after operation.”

Interference with the function of the bladder as a result of the operation has not been observed in Edebohls' cases. The urine is generally drawn for two days, after which it is voided in the bed-pan.

Primary union has been the rule, except during a brief period of repeated deep suppuration from infected silkworm-gut, which material was being used at the time in the form of buried sutures. In cases of primary union the scar, according to Edebohls, becomes practically invisible after six months to a year.

The review of Edebohls' 116 cases as to ultimate results shows only four absolute failures.

In one case the round ligament was not found on one side; in two cases sloughing of the ligaments occurred, and in one adhesions of an ovary pulled back the ligaments into the abdomen on that side. Two of these patients were subsequently cured, one by vaginal and the other by ventro-fixation. There were five relative failures due to the giving way of one round ligament within the abdomen, but the cases were subsequently cured by ventro-fixation. One patient died within a week from acute gangrenous appendicitis with septic peritonitis. In the remaining 106 patients the uterus remained in normal anteversion when last examined, the period of observation varying from one month to six years and a half after operation, and averaging over sixteen months for each of the 106 cases. Twelve pregnancies are known to have occurred in eight of the successful cases. Of these, two terminated in abortion, one was lost sight of after the seventh month, and one gave birth to a living child.

Suspensio Uteri. The latest views of Kelly upon this subject are to be found in his text-book (*Operative Gynecology*, 1898). Preceding the consideration of the operation he lays down a cardinal principle which, if judiciously followed, will in many instances so far relieve the patient's suffering from this disability as to render the more radical measure unnecessary.

The principle enunciated by Kelly is as follows: "Suspension of the uterus should be resorted to only in cases of persistent retroflexion which refuse to yield to simpler plans of treatment through the vagina, and then only when the discomforts of the retroflexion are sufficient to interfere seriously with health."

The simpler plans of treatment consist in the application of packs and pessaries, the manual reduction of the retroflexion and resection of the relaxed vaginal outlet.

The third measure has been insisted upon by T. A. Emmet as the chief and only necessary one in the radical cure of retroflexion, for, according to his philosophy, the mechanical causes lie in the deficiencies of the vaginal supports. Correct these and the uterus will attend to itself. While Emmet's rule is, perhaps, too dogmatic, there is, nevertheless, a great deal of truth in it.

As a test for the probable effect of the suspension operation, Kelly says that if upon the application of a wool-pack, sufficient to support the uterus, the symptoms are relieved, a permanent cure may be expected from the operation.

The three chief objections which have been offered to this operation are, first, that the anteposition affected by the suspension is unnatural and,

therefore, pathological; second, that the attachment of the uterus to the abdominal wall prevents the proper distention of the bladder, consequently the patient suffers with dysuria, and, third, and perhaps the greatest objection, the dangers of parturition complications in case of pregnancy.

According to Kelly, all of these objections have been successfully and satisfactorily answered by the final results in the cases. The chief point to be considered is whether the uterus is fixed or suspended. If fixed, all sorts of complications may arise, if simply suspended untoward results are seldom if ever induced by the operation.

OPERATION. Like all other well-tested operations, this one has also passed through its evolutionary stages, and after a very extensive experience the present plan has been adopted as giving the best results and fewest complications. The various details have been so carefully described by Kelly and generally commented upon by numerous writers that I shall only give the chief steps in the operation as it is now performed. They are as follows:

1. Abdominal incision 4 to 5 cm. ($1\frac{1}{2}$ to 2 inches) in length in the median line, ending at a point 2 cm. from the symphysis.
2. Catch the peritoneum on both sides with artery forceps and draw it out upon the abdomen.
3. Release the uterus if adherent and tip it forward with the index and middle finger.

4. Introduce a fine silk suture parallel to and from 1 to 1.5 cm. from the edge of the peritoneum, including an area 8 to 10 cm. broad.

This suture is carried through a part of the posterior surface of the uterus 1 to 2 cm. below a line connecting the Fallopian tubes, taking in uterine tissue about 1 cm. in breadth and 3 to 4 cm. in depth. The needle is finally carried through the peritoneum and subperitoneal tissue on the opposite side of the incision, corresponding to the first side. Before tying the suture exploration should be made with the finger to be sure that the omentum or intestine is not caught. After the first suture is tied a second is introduced in a similar manner, 1 cm. above the peritoneal part of the first suture, and 1 cm. below the uterine part.

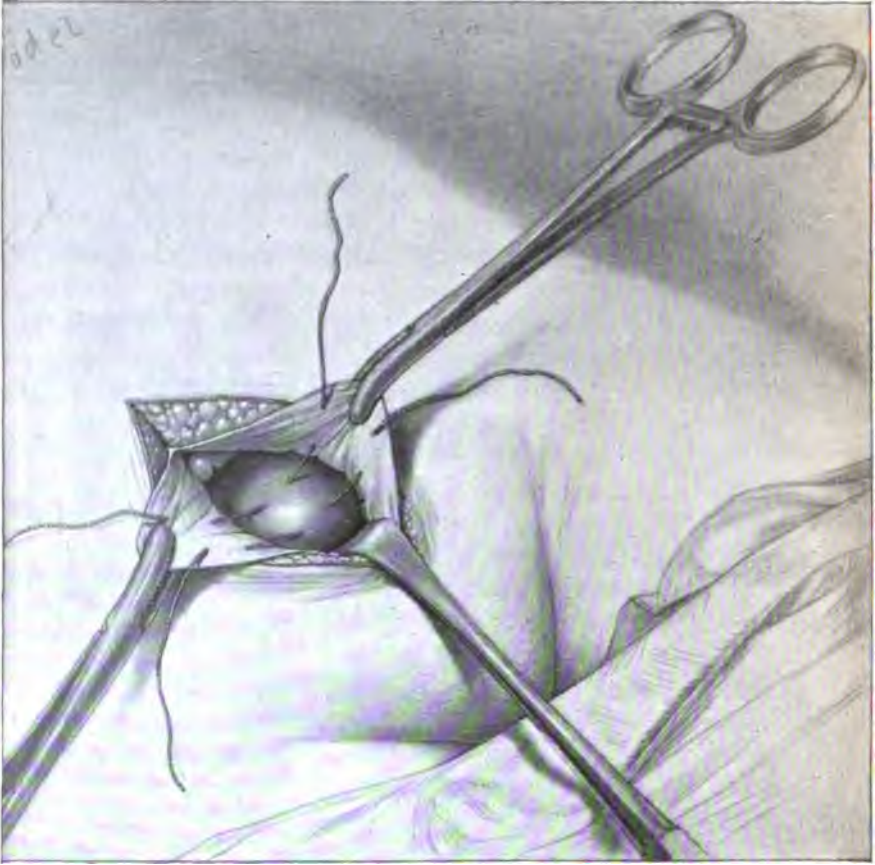
5. Closure of the incision in the usual way.

There is practically no mortality after this operation, and the risks from stitch abscesses and hernia are so slight as not to be worth considering. In a very large experience with these cases I have never yet seen a hernia follow the operation, and in one series of 119 cases, only one stitch-hole abscess occurred.

J. E. Stokes has followed the subsequent histories in 75 of Kelly's cases with the following results: Of the 75 cases 49 were married and 26 were single. The 49 married women reported 14 pregnancies, 9 of

which were absolutely normal ; of the remaining 5, 1 case suffered from the beginning of gestation with abdominal pain ; 1 patient, now pregnant, feels wretchedly, with pain over the abdomen ; another case miscarried after "violent dancing," and in 2 more cases the placenta was retained. In general, 27 women were entirely relieved of their discomfort ; 37 were greatly benefited, and 11 were unrelieved.

FIG. 44.



Suspension of the uterus. Showing the two silk suspensory sutures passing through the peritoneum, the movable subperitoneal fat, and connective tissue on both sides, and through the posterior surface of the uterus in the middle. The suture nearest the symphysis is always tied before introducing the second suture. (KELLY: *Operative Gynecology*, 1898, vol. ii.)

The first really comprehensive review of the ultimate results in these cases was made by Noble,¹ who was incited to the task by a death from

¹ "Suspensio Uteri, with Reference to its Influence upon Pregnancy and Labor," *American Journal of Obstetrics*, vol. xxxiv. No. 2.

a Porro operation, which was performed because of insuperable dystochia resulting from a ventro-fixation operation. He collected 808 cases of suspensio uteri in which at least one ovary remained so that pregnancy was possible. Of this number 56 (6.9 per cent.) have become pregnant. Seven women had not yet been delivered when Noble's report was made. There have been six abortions, or 10.7 per cent. Forty-three have been delivered at full term or shortly before it; there have been 3 deaths; 1 followed a Porro operation by Noble, in a woman who was septic when the operation was done. There were 2 deaths among the cases of Edebohls; 1 died of heart disease before labor, and the other was septic

FIG. 45.



Diagram showing the position of the uterus in retroflexion in dotted line, and the position of the uterus held in anteversion by the two suspensory sutures. Note the yielding of the peritoneum. (KELLY: *Operative Gynecology*, 1898, vol. ii.)

before labor, the sepsis being due to a dead ovum. In two of these cases the operation proved to have had nothing to do with the death, and we may therefore consider that there has been only one death attributable to the operation which would make a mortality in labor of about 2 per cent.

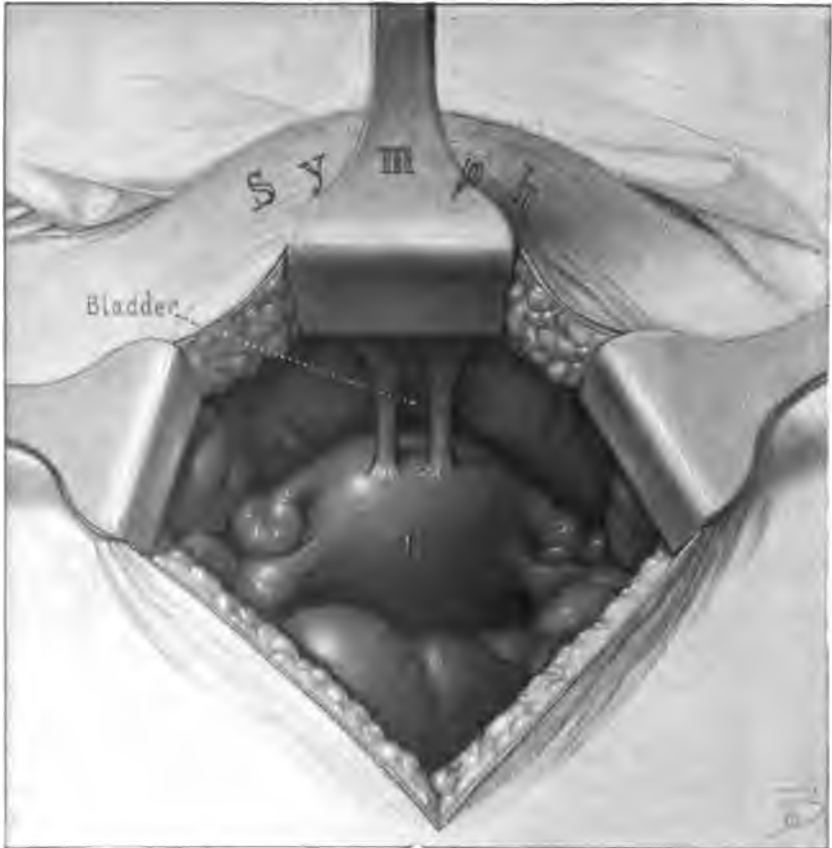
The complications in labor have been as follows: Forceps delivery, 3; Porro operation, 1; retained placenta, 2; septic before labor, 1; heart disease, 1; uncontrollable vomiting (labor induced), 1.

The influence of the operation upon fertility is merely indicated by the fact that of 808 women operated upon there have been only 56

pregnancies. Noble believes the only safe conclusion to be drawn from this fact is that pregnancy is not so liable to take place among women requiring suspensio uteri as among women in general.

Of the 56 pregnancies, 6 have terminated in abortion, or 10.7 per cent. A further study of this question shows that two of the abortions occurred in the same woman; that a third occurred after dancing, and

FIG. 46.



Suspension of the uterus seen from above; from a case opened six months after the suspensory operation. (KELLY: *Operative Gynecology*, 1898, vol. ii.)

that a fourth was probably criminal. This, according to Noble, would indicate that the operation has no tendency to induce abortion.

Of the three deaths two were believed by those in attendance to have had no connection with the operation. One certainly had not, as the woman died of organic heart disease. In Noble's case the Porro operation was necessary because the hypertrophied anterior wall and fundus of the

uterus were imprisoned below the point of attachment to the abdominal wall, and constituted a tumor obstructing the inlet of the pelvis.

The remaining complications in labor have been few—three forceps deliveries, two retained placenta, and one induced labor on account of uncontrollable vomiting.

After this review of results Noble believes the only legitimate deductions to be drawn are: (1) That the women subjected to this operation are less apt than others to become pregnant; (2) that pregnancy and labor, as a rule, are uncomplicated; (3) that inertia uteri is not infrequently met with; (4) that serious or insuperable obstruction to labor may be produced if the fundus and anterior wall of the uterus are imprisoned below the point of attachment between the uterus and abdominal wall.

As a result of Noble's careful review and analysis, it appears definitely settled that serious dystochiæ only occur in cases having broad adhesions between the uterus and abdominal wall, and, since the recent modifications have entirely obviated this difficulty, it need no longer be considered.

The following statistics of 2500 cases of suspensio uteri have been collected by A. Lapthorn Smith,¹ of Montreal, from the practice of forty American gynecological surgeons. Out of this number pregnancy occurred in 146 cases. In 36 of these there was pain, miscarriage, or difficult labor requiring obstetrical operations, and 2 of the latter died. The accidents occurred in those cases in which the uterus had been fixed and not in the simple suspension cases. Many of these operators have, therefore, discarded fixation entirely, and perform only suspension operations by fastening each round ligament near the fundus to each side of the abdominal incision.

The result of these cases was very good, the only drawback being an occasional suppuration of the buried stitches, necessitating their removal. Others have opened the abdomen and sutured the round ligaments within the abdomen. With the results of the suspension operation only three or four of Smith's correspondents were dissatisfied.

Notwithstanding the splendid results which Smith has obtained in his own operations, and the favorable reports collected by him from other American surgeons, he appears to have had his views radically changed by his flying visit through the clinics of Europe, where he saw, as he thought, most brilliant demonstrations of the advantages of the vaginal shortening of the round ligament.

As an evidence of his conversion he says this will be his operation of the future.

J. Riddle Goffe,² of New York, has also adopted a procedure similar

¹ British Medical Journal, 1898, vol. ii. p. 792.

² American Gynecological and Pediatric Journal, vol. xi. p. 825.

to that described by Wertheim. The only difference is that the round ligaments, after the uterus is delivered into the vagina, are simply stitched together and tacked to the fundus.

Burrage,¹ of Boston, has made a careful comparative study of seventy-one cases in which suspensio uteri was performed, and a like number in which the Alexander method was followed.

In the study of the remote results, reliable statistics were obtained from sixty-two Alexander and sixty suspensio uteri cases.

In contrasting the Alexander with the suspension operation as to immediate and remote results, Burrage, at the outset, was impressed with the fallacy of statistics, knowing that many of the Alexander operations had been performed on patients upon whom, in the light of a larger experience he would have elected to do the suspension operation, and also that the Alexander operation had been performed so much earlier than the suspension that a much longer period had been given to the former in which pregnancy and other post-operative complications might result. He, therefore, expected to find a poorer showing for the Alexander in comparison with the suspension operation.

The remote results of the Alexander operations were 77 per cent. good as against 93 per cent. good for the suspension. Hernia followed the Alexander operation in 3 per cent., and the suspension operation in 1.7 per cent. Twenty-five per cent. of the subjects upon whom the Alexander operation was done, who became pregnant, had tedious labors. No tedious labors have been noted after the suspensio-uteri operations. One of each class of patients had excessive pains during the early months of pregnancy. One-third of the Alexander subjects had the uterus retroverted after labor. In the suspension cases the statistics as to these facts are deficient. Only one patient was known to have had retroversion following labor. Pains in the scars have been noted after the earlier Alexander operations, and rarely these pains have persisted a considerable length of time. These may be contrasted with the drawing sensations noted after some of the suspension operations, but the latter symptoms have never been more than temporary.

After neither operation was there interference with micturition, and neither operation was the cause of abortion nor of miscarriage.

Some of Burrage's general conclusions are as follows: The Alexander operation is preferable to the suspensio-uteri operation because it seeks to support the uterus by its natural supports.

The Alexander operation is indicated in retroversion, retroflexion, and retroposition without ovarian disease.

In ovarian prolapse, especially if the ovarian ligaments are long, the

¹ Medical News, October 8, 1898.

Alexander operation cannot be depended on to raise the ovaries into a normal position.

The suspensio-uteri operation is indicated in retroversion, retroflexion, and retroposition, with ovarian or tubal disease, whether it is an inflammatory affection or prolapse.

Suspensio uteri leaves but one weak spot in the abdominal parieties, predisposing to hernia, instead of two as in the Alexander operation.

In the great majority of cases neither operation is the cause of complications in subsequent pregnancy. Whatever complications do occur are not of a serious nature.

In all cases of doubtful diagnosis in which the condition of the ovaries and tubes cannot be determined accurately, the suspensio-uteri operation is to be preferred to the Alexander operation.

Beside the operations already enumerated Martin and Ferguson, of Chicago, have each proposed a new operation within the last year; but as they have barely been christened, and certainly do not offer any marked advantage over their predecessors, a review will not be made of them at this time.

Brief Résumé and Criticism. Throughout the entire discussion in both Germany and America we find the preliminary statements in nearly all of the papers discussing and advising the use of pessaries, packs, postural treatment, and various other palliative remedies, and yet the great number of operations which have been recorded lead one to think that this advice is carried out by many gynecological surgeons only when the patient refuses operation.

The statistics of Winter and Theilhaber are entirely too convincing to permit us to overlook the fact that simple retroflexio uteri is almost, if not entirely, free of disturbing symptoms. How far the bizarre symptoms of the female neurasthenic may be attributed to the retroflexion no one can positively say, but the fact that comparatively few of them are relieved by operation leads one to believe that it plays a very little part in their production.

The great error which creeps into our diagnosis in these cases is that we do not see enough normal women with retroflexion to leaven our judgment, for certainly the statistics of Winter, Thielhaber, and incidental cases of every careful observer, have shown beyond doubt that so far as her daily vocation and personal comfort are concerned, a woman may have a marked retroflexion without suffering the slightest discomfort from it. These cases, which we have every reason to believe are very numerous, never see the physician, consequently they are not sufficiently taken into account in considering a line of treatment.

For instance, in Winter's examination of 302 women whom he considers in general as belonging to the normal class, for they had only been

inmates of the obstetrical and not the gynecological wards, he finds 36, over 10 per cent., with retroflexion. Of this number 11 were absolutely well women and had not the slightest symptom which could be attributed to the misplacement of the uterus. Of those who had discomforts the retroflexion was associated with some pelvic lesion in 21 cases, leaving only 4 in whom there was any suspicion of the malposition being at the bottom of the complaints.

In fact, the symptoms in these cases were so ill-defined that Winter could not make up his mind whether or not they were produced by the retroflexion.

Then, too, Theilhaber's long study of this question leads him to believe that the so-called symptoms of retroflexion are in no sense characteristic, for his tables show an equally large percentage of women with normally posed uteri suffering from precisely the same symptoms.

In looking over the lists of operative cases in which the ultimate or rather curative results are known, we find a considerable percentage which still continue to suffer with the same discomforts as before operation. Edebohls, for instance, in reviewing the therapeutic results in his 115 cases of shortening the round ligaments, says, "the less searchingly we cross-question our patients, the more superficially we go into their after histories, and the less thoroughly we examine them in the endeavor to obtain evidence to the contrary, the more likely are we to record a large number of therapeutic successes." Thus diseased conditions have been found after operation sufficient to prevent a cure in 29 of his 115 cases. In 41 other cases various ailments arose shortly after operation which also prevented a cure.

Of 75 cases operated upon in the Johns Hopkins Hospital from whom reliable reports were obtained, 27 cases were entirely relieved, 37 were greatly benefited, and 11 were no better.

The results of Thielhaber and Winter's study of normal cases, taken in conjunction with these therapeutic results of operative treatment, leave absolutely no doubt in my mind that retroflexio uteri simplex plays a comparatively small rôle in the production of symptoms.

To what, then, are we to attribute the symptoms which are so often present in these cases? This question is at once answered by the foregoing statistics. The symptoms, as a rule, do not originate in any general systemic disease or lesion remote from the pelvis, but from coincident disease of the uterus or its appendages.

GENERAL AND LOCAL TREATMENT. The treatment, therefore, should be directed to the latter conditions and not to the retroflexion. The various local treatments may be passed over with a few words, for nothing novel in this line has been introduced of late which deserves especial attention.

The first essential to proper treatment should be a careful examination of the patient, and to accomplish this anæsthesia may be required. This measure should not, however, be employed immediately, for after two or three visits the usual office examination may prove perfectly satisfactory.

Among the various methods of treatment which have been recommended, I consider some of the conservative ones almost as reprehensible as the more radical. For instance, Schulze's method of forcible avulsion is repugnant to me, for I feel that great harm may be inflicted. To illustrate its dangers it is only necessary to recall v. Rosthorn's two accidents, in which he ruptured the rectum in one case and in another bored his finger through the vagina. Such haphazard methods should certainly not be employed, for even in the hands of a skilled man accidents may happen. If, after a careful examination, only a simple retroflexion is discovered it should be considered merely as a starting-point for a much more general search for every possible allied ailment which could give rise to the symptoms. The symptoms of simple vesical irritation, hemorrhoids, fissure in ano, etc., may so closely simulate those attributed to retroflexion as to be shouldered off upon the really unoffending organ. One might name several pathological conditions of the pelvic organs and of general ailments which may give rise to the so-called retroflexion symptoms.

Nowhere in medicine does the quotation from the philosophical writings of Socrates, which stands as the opening cautionary advice in Kelly's *Operative Gynecology*, apply better than at this point. It is as follows: "And this is the reason why the cure of many diseases is unknown to the physicians of Hellas, because they are ignorant of the whole, which ought to be studied also; for the part can never be well unless the whole is well."

The careful employment of the various methods of local treatment, postural replacement, judicious application of pessaries, and, in well-selected cases, massage in the hands of a well-trained masseuse, and, above all, the regulation of the bowels and general health, will relieve a very large number of cases.

In these simple cases the mental part of their "womb trouble" is the predominating one, and any form of exercise or pleasant diversion which will relieve this neurasthenic introspection will effect a cure.

These cases, as expressed by McMonagel, become "tied to the physician's office." As soon as the effects of the various local treatments are given a fair trial, and prove of no value, they should be absolutely dropped, for to continue this line may convert a curable patient into a malignant neurasthenic. Either a cessation of all treatment, in the hope that time may correct the evil, or a resort to operation, in the

hope that the purely mental effect will be curative, is the only advisable course to follow in such cases. These are the patients who give the general practitioner no end of trouble. As a physician said on being told that his patient had no lesion justifying operation, "Yes, but the disturbance to my mental equilibrium from the constant visits to my office of this woe-begone woman absolutely demands for my sake that some operation be performed."

In such cases we may be driven to operate and occasionally obtain a result which justifies the experiment. As a rule, however, these patients are not relieved by this means.

I have seen brilliant demonstrations of the value of congenial and diverting exercise in patients who have taken up bicycle riding, as the result of which all of their local symptoms have disappeared and they have entirely recovered their physical and mental equipoise.

OPERATIVE TREATMENT. Having eliminated as far as possible all cases which may be relieved without operation, there still remain a few uncomplicated and a considerable number of complicated cases requiring this treatment.

Of the wealth of original operations and their numerous modifications, which are we to select, and what are our reasons for so doing?

First, as to what cases shall be operated upon, I think the statistical studies of Winter, Thielhaber, Olshausen, and others show that very few uncomplicated cases give sufficient symptoms to justify operation.

In young women the operative measures, although successful in some instances, also frequently fail to relieve the menstrual symptoms. In other words, the dysmenorrhœa from which these younger women suffer is not of uterine but of ovarian origin.

This, then, brings me to the choice of methods. As I have already stated, the vaginal methods of Mackenrodt and Dührssen are too dangerous, and should not be employed. Only two methods of choice are left: The shortening of the round ligaments and the suspension of the uterus.

From the reviews of Stokes, Penrose, Smith, Noble, Burrage, and other American gynecologists one can say with complete assurance that the suspension operation as now performed is practically free from disastrous sequelæ, and restores the uterus to a good position. Although the means of suspension may be abnormal, so long as it serves its purpose and does not cause untoward symptoms, it cannot be considered pathological, for the new condition is not a diseased one. (Fig. 40.) The advantages of the Alexander operation, on the other hand, as stated by the majority of writers, are that it more closely follows nature's means of holding the uterus in the proper position, but since we feel that the

uncomplicated cases in which it is most applicable seldom require operative treatment, it is naturally very much limited in its scope.

Where adhesions or lateral complications exist the suspension operation is certainly the preferable one, for through the abdominal incision the complication can first be treated, and the correction of the retroflexion then becomes merely a concluding part of a combined operation.

A word in finishing as to the Wertheim method of shortening the round ligament per vaginam. While I have unreservedly advised against the employment of the vaginal and vesical fixation methods, I feel that possibly the shortening of the round ligaments through a vaginal incision may have a place in our future list of operations.

In cases of relaxation of the vagina or in prolapsus it is a comparatively simple matter to snip a hole between the cervix and bladder through which the round ligaments may be brought down, either with a hook or by actual eventration of the uterus, so that reef-like folds may be taken in them.

If time proves that the Wertheim method gives permanent results, I can see no objection to its adoption in cases of retroflexion associated with descensus in which a plastic operation is also to be performed.

To the surgeon who wishes to be on the safe side, however, caution in accepting this operation until its ultimate results are definitely known will be the best policy.

EMPHYSEMA OF THE ABDOMINAL WALL AFTER LAPAROTOMY.

This peculiar complication of abdominal operations is rare, two cases reported by Russell of the Johns Hopkins Hospital two years ago being the first recorded in American literature, although this condition had previously been recognized by German writers.

In the cases reported by Meinert, Leopold, Madlener, and Gräfe, the emphysema was attributed to the Trendelenburg posture and accordingly it was advised that the patient be always lowered to the horizontal posture before closure of the abdomen. Heil, who carried out a series of experiments upon rabbits, believed this condition only occurred when the peritoneal layer of the incision was poorly closed, and that the posture had little or nothing to do with it.

Simple emphysema of the parietes when due to the forcing of air from the abdomen out into the subcutaneous tissue of the abdominal wall is entirely without danger; but when produced by the gas bacillus described by Welch, it at once becomes a very serious complication and demands immediate attention.

Weller Van Hook, of Chicago,¹ has recorded another of the simple cases which followed an abdominal operation for sactosalpinx. The wound was closed with figure-of-eight suture while the patient was in the Trendelenburg position. On the morning following the operation the patient noticed on pressure a slight crackling sensation in the subcutaneous tissues. The resident physician, on examination, found that bubbles of air could be pressed about, beneath the skin, on both sides of the wound from Poupart's ligament upward as far as the umbilicus. The quantity of air steadily diminished, but did not entirely disappear for five weeks. The patient at no time suffered the slightest discomfort from the complication.

So far only one case of emphysema resulting from the gas bacillus has been reported. The case was observed by J. C. Bloodgood, of Baltimore, and is recorded in Kelly's *Operative Gynecology*, 1898, vol. ii. :

"S. R., surgical No. 6102. Diagnosis, chronic appendicitis. Operation, February 17, 1897: Removal of the appendix between the recurring attacks; the incision was made through the right rectus muscle, the adherent appendix was dissected free and excised, and the stump closed by suture; a large gauze drain was packed down to the stump.

"On the day of operation the patient returned to the ward with a pulse of 100; the evening temperature was 99.3° F. (37.3° C.); pulse 96. At 9.45 P.M. emphysema was discovered in the wound, extending out on the left side of the abdominal wall, and on the right side into a blood-clot cavity. The material in the cavity was chocolate-colored and contained bubbles of gas, and the surrounding muscular tissue appeared necrotic. Great numbers of gas bacilli were found in the tissues and in the blood-clot. Cover-slips from the clot showed a few leucocytes, a few red blood-cells, and débris; the field was filled with large capsulated bacilli of three sizes. Numbers one and two were numerous; a few were in chains of five.

"Second day: Patient noisy and restless all night. At 4 A.M., sixteen hours after operation, the temperature had risen to 104.4° F. (40.2° C.), pulse 144. At 8 o'clock this morning the temperature was 103.5° F. (39.4° C.); pulse, 128; respirations, 36, now and then intermittent, entirely thoracic. Patient has had no nausea and vomiting since leaving the operating-room. Small fluid, reddish stool; cover-glass preparations from stool show great numbers of gas bacilli.

"At 10.30 A.M. the temperature was 104.8° F. (40.5° C.); pulse, 136; respirations, 50. Wound opened and irrigated. 11 A.M., pulse, 160; respirations, 60. 12 M., temperature, 105.6° F. (40.8° C.); pulse, 160; respirations, 60. 1 P.M., rapidly failing; died at 1.45 P.M.

¹ American Gynecological and Obstetrical Journal, 1898, p. 298.

"Blood cultures taken immediately after death negative. Cultures taken at autopsy, eight hours after death, from all organs, showed myriads of bacillus capsulatus *aërogenes*."

Bloodgood's advice in such cases is as follows :

"Whenever emphysematous areas are discovered about an abdominal wound, a small incision should be made in order to obtain cover-glass preparations and cultures. If the bacillus *aërogenes capsulatus* is found, no time should be lost in opening the wound and irrigating it freely and packing with gauze."

In the case above reported the wound was freely drained, but, notwithstanding this means of exit, the infection proved rapidly fatal.

PERIVAGINITIS PHLEGMONOSA DISSECANS.

Under this name Marconnet,¹ in the year 1865 described a condition in which the entire vaginal wall in conjunction with the portio-vaginalis was cast off through a suppurative process. The cause of this extensive local necrosis was ascribed by Marconnet to a perivaginal phlegmon which so far disturbed the nutrition of the vaginal wall as to induce complete gangrene and exfoliation of these parts.

Following Marconnet various writers, all of whom agree with him as to the etiology, have reported similar cases.

Busse² reports an interesting case, but takes exception to Marconnet's explanation of the local gangrene, claiming that the primary cause lies within the vagina and not in the perivaginal tissue.

Briefly stated his case was as follows : A carpenter's wife, thirty-nine years of age, until two years before her admission to the hospital had been healthy. At that time she gave birth to twins, following which she had a long-continued feverish puerperium. Subsequent to the confinement menstruation did not again appear, and the patient suffered such constant pain in the abdomen that she was compelled to remain almost continuously in bed. For the relief of this illness she reported to the Gynecological Clinic of the University of Griefswald. On vaginal examination a closure of the vagina, 5 cm. behind the introitus, was found, which, however, was broken through by the examining finger. Following the breaking up of the adhesions the patient had such severe bleeding as to require a tamponade, and when this failed to control it a second tamponade with a solution of the sesquichloride of iron was applied.

Examination subsequent to this application revealed a raw, granulating

¹ Virchow's Archiv, 1865, Bd. 34.

² Ueber die Sogen. Perivaginitis Phlegmonosa Dissecans, Archiv. f. Gynäk., vol. lvi. p 489.

surface with a strong tendency to secondary adhesions of the vaginal walls. The patient was discharged at this time. On readmission to the hospital four months later, after having suffered almost continuously with symptoms similar to those noted before her first admission, complete closure of the vagina had taken place. Again, the adhesions were broken up and the bleeding controlled by gauze packing. On removal of the tampon severe hemorrhage followed, requiring for its control the reapplication of a pack of iodoform gauze saturated with the sesquichloride of iron and a small part of chloride of zinc.

Extensive suppuration followed the last application, and within twelve days the entire vaginal wall was discharged as a cast. From this time on the patient was continuously invalided, and the vagina finally became completely obliterated by adhesions.

In Busse's concluding remarks a similar case reported by Nammack is referred to, in which the shedding of the entire vaginal wall had followed the application of an iron preparation for the purpose of controlling hemorrhage. With the exception of these cases of Busse and Nammack, necrosis and exfoliation of the vaginal wall have almost exclusively followed a severe infectious disease, most frequently as a sequel of typhoid fever.

The first case described by Marconnet was that of a twenty-year-old girl, who, although able to walk about, had suffered many weeks from fever and pain in the abdomen. Following a considerable hemorrhage from the vagina the entire vaginal wall was discharged as a cast. In the second case reported by the same writer the history of the disease was essentially the same.

A third case, reported by Minkiewitsch, was that of a young prostitute who was admitted to the hospital in a highly feverish and unconscious condition. Three days after her admission the entire vaginal wall was discharged as a cast. Autopsy upon the patient two days later showed the primary disease to be typhoid fever. There was a deep suppurating cavity in the pelvis, and the posterior wall of the bladder and anterior wall of the rectum had been entirely destroyed.

Tschernuschew has reported from St. Petersburg two similar cases following typhoid fever. To this list Wiegandt has added an interesting instance in which, following a prolonged attack of fever of unknown origin, not only the mucosa but also the musculature of the vagina was cast off.

Not only has this extensive destruction of the vaginal walls followed typhoid fever, but, according to Bröse and Bizzozero, it has also occurred as a sequel of pneumonia. A case, which so far is entirely unique, is that of Syromjatnikoff, in which the gangrenous condition of the vagina occurred without any antecedent causes, such as those noted in the pre-

ceding cases. The only traceable source was a urethritis, from which the husband had suffered for some time. In this instance Busse, as would be quite natural to any person versed in the condition underlying infectious processes, fails to trace the connection between such a serious tissue destruction and such a minor cause.

While Busse endeavors, from his study of the case in hand and those already recorded, to draw conclusions in favor of his theory that the gangrenous condition is a result of local destructive agents within the vagina rather than from a perivaginal influence, I think he has signally failed.

In his case the application of the solution of iron and the small part of chloride of zinc would appear to have been the direct cause of the vaginal necrosis.

When perivaginitis follows in the train of such a disease as typhoid fever, it is not rational to ascribe it to any other than an embolic cause. Both Keen and Parsons have shown that bone lesions from which cultures of the typhoid bacillus have been obtained are not an infrequent sequel of typhoid fever, and rare cases of post-typhoidal suppurative orchitis of such a severe grade as to entirely destroy the testicle have been reported.

As the question now stands, I should say that Marconnet's original term, perivaginitis phlegmonosa dissecans, should remain in gynecological nomenclature to designate those cases following general infectious processes, whereas the name kolpitis gangrenosa or necrotica, suggested by Busse, may correctly be used in cases where the necrosis is directly traceable to a local chemical or infectious irritation, as seen in his cases.

TUBO-OVARIAN HEMORRHAGE RESEMBLING RUPTURED ECTOPIC PREGNANCY.

Within the last decade gynecologists have very generally discarded the diagnosis of pelvic hematocele, which was frequently made in former times when ectopic pregnancy was not recognized clinically, and in sharp contrast to the older literature we rarely see this condition spoken of at the present day. That tubo-ovarian hemorrhage may occur entirely independent of either ectopic pregnancy or of traumatism, is hardly taken into consideration in our clinical diagnosis, and when free blood-clots or encapsulated hemorrhagic collections are found within the abdomen, the diagnosis of ectopic pregnancy is usually made without further question. Of course this diagnosis is correct in a very large percentage of cases, but occasionally the most careful microscopic examination fails to reveal any of the essential diagnostic features of ectopic pregnancy.

Attention has been called again to the subject of atypical tubo-ovarian hemorrhages by J. Wesley Bovée,¹ of Washington, in the report of an extremely interesting case which appears without doubt to have been a simple hemorrhage in no way incident to pregnancy.

The menstrual period had been slightly delayed and then began with great pain and the flow had continued up to the time of operation.

The patient was pale and quite feeble, the pulse rapid and weak, and the temperature elevated. A mass was felt above and to the left of the uterus, and the right appendages were much enlarged and adherent. The uterus was large, well forward and partially fixed, but nothing abnormal was noticed on palpation in Douglas' pouch.

Upon making the abdominal incision the peritoneum was found to be stained a deep brown, and when it was opened a large quantity of fluid and coagulated blood escaped. With such signs as these, ruptured tubal pregnancy was immediately diagnosed. The omentum was glued down at one small point on top of the left Fallopian tube, an inch from the abdominal ostium; this tube lay above the bladder and broad ligament, and with its accompanying ovary was adherent but readily separated, elevated, and removed. The mass had the shape of a bologna sausage, its dark-blue covering being no thicker than that of the sausage. At the site of adhesions of the omentum to the tube a small punctured opening was found, the margins of which were covered by omentum. The other appendages, being badly diseased, were also removed. The peritoneal cavity contained a considerable quantity of blood-clots, principally collected in the pelvis, but not walled off by adhesions. The specimen was found to be not a ruptured tubal pregnancy, but a small collection of blood in the ovary and a larger one in the tube. These were connected by a small sinus formed by a groove in the fimbria of the tube adherent to the ovary. A small probe could be passed from the tube through the canal into the ovarian blood-sac and on through the opening in the wall of the ovary into the peritoneal cavity, by which route the blood had escaped. The tube was distended by a large unorganized blood-clot, very black and readily separated from the tube wall. Bovée believes that the hemorrhage probably originated in the ovary. The only point of the fimbriated end of the tube that was not closed was adherent to the ovary and as the hemorrhage continued the internal pressure against the sac wall became so great that rupture into the tube occurred. Beside this the ovarian sac had ruptured later, under further pressure, into the peritoneal cavity.

Notwithstanding all of the symptoms of ectopic pregnancy, Dr. Lamb, of the Army Medical Museum, positively declared after a microscopical examination against this diagnosis.

¹ American Gynecological and Obstetrical Journal, 1898.

When we take into consideration the inflammatory symptoms noted in this case, the explanation of the hemorrhage does not appear especially difficult.

In normal individuals at the time of the menstrual congestion the ovary becomes greatly distended and very turgid, and any follicle which may be mature at that time ruptures, immediately collapses, and the temporary hemorrhage incident to the laceration of the tunica albuginea very soon ceases. If, on the other hand, the ovary with its tubes is adherent and inflamed, as in Bovée's case, the conditions become greatly changed, for not only are the vessels of the cortex and tunica albuginea congested and enlarged, but they may, through splinting of the ovary by adhesion, be hindered from contracting after the rupture of the follicles, and consequently a hæmatoma of considerable size may form.

This case is not only interesting but instructive, for it again reminds us that no case of pelvic hemorrhage originating in the ovary or tube should be regarded as due to ectopic pregnancy without absolute macroscopic or microscopic proof.

ENDOMETRITIS HYPERPLASTICA OVARIALIS.

In view of the intimate relationship existing between the ovaries and uterus, it is surprising that a greater number of reflex conditions do not arise in the one as the result of pathological changes in the other. Perhaps we shall find sooner or later that the ovaries play a greater rôle in menstrual difficulties than is now attributed to them. The influence which the ovary may exercise in the reflex induction of pathological changes in the endometrium was first called attention to by Brennecke, but until quite recently it has received no further attention. In six cases of metrostaxis a hyperplastic endometritis was found, the origin of which he ascribed to pathological influences emanating from the ovary.

The chief clinical symptoms in his cases were as follows: The primarily regular menses began to appear at longer intervals (five to six weeks) and in some instances even farther apart. Then occurred, in some cases sudden, in others prolonged, bleeding. Curettement was only of temporary service in alleviating the symptoms, and its frequent repetition was necessary in some cases.

As the most prominent symptom Brennecke considered the retardation of the menses. He believed the primary cause of the functional disturbance existed in the ovary, for ovulation, which had previously been normal, had become a pathological function, and thus acted as a primary factor in the disturbance of the menstrual flow.

According to Pflüger's theory, menstruation depends upon the nervous irritation produced by the growing Graafian follicles.

Concerning the synchronicity between ovulation and menstruation there has been a running discussion for many years. Investigations by Leopold would seem to prove that the rule of synchronicity may frequently be broken, for in a considerable series of cases studied by him the two functions did not fall together. Let that question stand as it may, the fact seems incontrovertible that the ovary exercises a direct controlling influence over the menstrual function as evidenced by its prompt cessation upon the removal of the ovaries. The question naturally arises: What support has Brennecke for his theory concerning this so-called "endometritis hyperplastica ovarialis?" Three of his patients were within the climacteric period, in which the changes in the histology of the ovary are naturally exercising a direct hemming influence upon the growth of the follicles. The increasing formation of connective tissue renders difficult the ripening and rupture of the follicles, and as a result menstruation becomes irregular. The reflex influence emanating from the ovary, while no longer of sufficient intensity to induce the periodical menstrual discharge, is nevertheless sufficient to induce the hyperæmia and hyperplasia of the endometrium. While Brennecke's theories are apparently not without grounds for criticism he has at least made a suggestion which is capable of development.

In establishing the correctness of Brennecke's theories it is at once apparent that trustworthy proof will only be obtained through the histological study of both the ovary and endometrium. After the pathological chain of evidence is completely established then, and not till then, can we admit the clinical symptoms as evidence, for as is well known the menstrual function is liable to derangement by innumerable local and systemic influences.

If a sufficient number of cases show upon microscopical examination uniform histological changes which are accompanied by a significant clinical history, then we may place "endometritis hyperplastica ovarialis" in the category of gynecological diseases.

Franz,¹ of Fehling's clinic, in Halle, has conformed to these conditions in his report of a new case. The patient had been under observation for seventeen years, after marriage, on account of sterility. During this time she had suffered from dysmenorrhœa, with prolonged and rather free bleeding lasting seven to eight days. Notwithstanding the employment of every possible measure for the relief of her sterility and menstrual ailments, the patient's condition grew rather worse than better, at least so far as the menstrual symptoms were concerned. Finally, on account of almost continuous hemorrhage, great pain and intense nervousness, total extirpation of the uterus and left ovary was resorted to for her relief.

¹ Archives f. Gynaæk., Bd. 56.

As the histological examination of the ovary and uterus is full of interest, and especially as this is along the line of new discoveries, a rather full abstract of Franz's description will not be out of place :

Microscopical examination : The tunica albuginea of the ovary is very much thickened and no longer shows any trace of germinal epithelium. The stroma is increased in amount and has the appearance of connective tissue seen in chronic inflammatory processes. The primary follicles and follicles in more advanced stages of development are present in large numbers, but it is especially striking how few are entirely normal in appearance, and these are all in the earlier stages of growth.

The majority of the follicles are undergoing retrogression without rupture, as shown by their relative smallness, their distance from the surface, and the lack of extravasation of blood into their cavities. All stages of obliteration are noted ; in some the follicle epithelium is detached ; in others it has entirely disappeared, while in others only a hyaline line remains at its site, which is either continuous or is broken through in some places by connective tissue. Through further obliterative changes and diminution in the size of the cavity this hyaline line assumes a wavy appearance.

The obliterative process occurs either through the growth of the theca interna, the ovarian stroma, or through the increase in size of the neighboring follicles. Even some of the primary follicles also show degenerative changes. The vessels are considerably reduced in numbers, and the degeneration in them is observed in localized areas. Thickening of the intima and media of the smaller arteries is the usual change noted, and hyaline degeneration is only of rare occurrence. Thickening of the walls of the veins is also occasionally observed.

The endometrium is considerably thickened, and in some spots is redundant and velvet-like. The glandular elements are considerably in excess of the normal number. The glands of the deeper layers are markedly branched, are lined with high cylindrical epithelium, and are separated only by a small amount of connective tissue. Toward the cavity of the uterus the glands are longer and less branching. In sections through the redundant portion of the mucosa the glands are long, less branching, parallel running tubes.

The connective tissue as it approaches the epithelial covering of the endometrium increases in amount, and its cells take on a decidual-like appearance. The epithelium has disappeared in places and always at the point where hemorrhage has occurred.

Diagnosis : Chronic hyperplastic glandular endometritis, associated with hyperplasia of the ovarian stroma, increased degeneration of the Graafian follicles and decrease in the number of ovarian vessels.

This interesting case of Franz has again brought to light an ailment which has hitherto only been recognized by Brennecke.

Every reader who has had an extensive gynecological practice will no doubt recall cases similar to this one, which have been passed over under the diagnosis of cystic or scirrhotic ovaries, etc. Although the cases of this rediscovered ailment are by far too few from which to draw other than tentative conclusions, nevertheless the tracing of cause and effect has been so direct as to furnish a strong basis for this new classification. Brennecke's theory, to say the least, is interesting, and is capable, I am certain, of further development. In reading Franz's description, similar cases which have been under treatment in the gynecological wards of the Johns Hopkins Hospital during the last four years are immediately called to mind. In one case, that of a young woman, menstruation had been greatly retarded in its inauguration, and when it finally began caused ceaseless disturbance through profuse and often almost continuous bleeding. Curettement effected only temporary relief and at last ovariectomy was resorted to on account of the progressive anæmia induced through the continuous hemorrhage.

Microscopical examination of the ovaries in this case showed a marked increase in the number of medium-developed follicles, many of which, as in Franz's case, showed unmistakable signs of degeneration. The tunica albuginea was strikingly thickened, and the surface of the ovary was very smooth and free from scar tissue or seam-like depressions.

In this instance the rupture of the follicles had been retarded from the very onset of puberty, and the excessive and prolonged irritation had kept up a constant hyperæmia in the pelvic organs. Not infrequently similar symptoms are noted in cases of chronic periöphoritis, where thickening of the capsule and increase in the density of the ovarian stroma occur.

RADICAL OPERATION FOR CARCINOMA UTERI.

As stated in the prefatory remarks of an article by the reviewer¹ on a "More Radical Method of Performing Hysterectomy for Carcinoma Uteri," the operative treatment of cancer of the uterus at best is, and will always be, an unsatisfactory means of treatment. The reason for this lies in the fact that the great majority of patients consult their physician when the pathological process has advanced far beyond operative limits; not, however, in the sense of the cancer being removed by metastasis to some more or less remote part of the body, but that the local involvement is such that eradication of the disease without serious or

¹ Johns Hopkins Hospital Bulletin, 1895-96.

fatal injuries to the ureters, bladder, rectum, or the great vessels is impossible.

In the same article the necessity of carrying the operation to its widest possible anatomical extent, if it was deemed advisable to operate at all, was dwelt upon.

The chief objection to vaginal hysterectomy is the close limitation of the excised tissue to the uterus, leaving in many instances minute carcinomatous areas on the very border line of the incision. The chief point brought out in the operations described by me was, first, the wide excision of vaginal tissue, for Russell's study of cases has shown that post-operative recurrences are almost invariably in the vaginal scar; my second point was the recommendation of the removal of the pelvic lymph-glands, which I found later had also been suggested by Ries, of Chicago, and Rumpf, of Berlin.

Whether the ultimate results are to be influenced by the latter suggestion I am as yet unable to say, but am inclined to believe that the removal of the glands will most likely prove of prognostic rather than of radically curative value. Upon this point, however, our judgment must be held in abeyance until the post-operative statistics become of more positive value.

Certainly the desire for more satisfactory methods of operating is universal, for many attempts have been made to improve the older methods in the hope of obtaining better results.

To any surgeon or physician who sees many of these cases throughout the course of their disease, an overpowering desire animates him to do something for their relief, for miserable, indeed, is the end of any victim of cancer of the uterus. The fetid vaginal discharge, the progressive decrease of weight, the gradual onset of the sickly yellowish cachexia, the increasing pain which may become intolerable in its intensity, the nausea from progressive uræmia incident to compression of the ureters, and, finally, the urinary or fecal fistula which may result from necrotic perforation of the bladder or rectum, make up a picture of distressing misery not equalled in any other disease. Any means, therefore, which holds out a promise of good therapeutic results should unhesitatingly be tried.

A most interesting experiment along a new line of therapy has been recently made by that erudite and scientific pioneer in gynecology, Freund, of Strasburg. He has been one of the foremost men in the operative treatment, having removed as early as 1888 the iliac glands in a case of carcinoma upon which he performed hysterectomy.

After having employed the radical methods with varying results, Freund¹ thought it possible to make a therapeutic application of positive

¹ Beiträge z. Geburtshilfe und Gynäk., Band 1, Heft iii.

value through medicated infusions into the uterine vessels. To first ascertain the action of simple salt infusions on the tissues he opened the femoral artery of a dog, inserted a canula connected with an injection apparatus mechanically arranged so that it would throw the artificial fluid into the vessels with the same pulsatile rhythm and strength as exercised by the heart. In these experiments Freund was able to switch the entire leg out of the general circulation, and through the injection of physiological salt solution to keep the parts for some time alive and uninjured, the full integrity of the tissues being entirely restored on reflux of the blood through the vessels. After eleven experiments upon rabbits and dogs, Freund was given an opportunity by a local veterinarian to try the experiment on a horse suffering with cancer of the hoof. While the injection was carried out successfully, no decided results were noted.

He next tried the procedure on a case of cancer of the uterus beyond the possibility of a curative effect from any known method of treatment. The uterus was successfully cut off from the main circulation and irrigated with salt solution for twelve minutes. The patient recovered from the operation, and for a few days did well; a very fetid vaginal discharge then set in and pieces of carcinomatous tissue were cast off. From this time on the patient steadily failed, and died eleven days after the operation. The autopsy revealed a necrotic condition of the carcinomatous tissue which v. Recklinghausen thought was due to the irrigation.

Freund did not feel justified in carrying his experiments further upon human beings, for he now believes the possibilities of cure lie in some other direction. He says, in closing this side of his paper: "The weak wind which filled the sail of cancer therapy through bacteriotherapy, through the use of alkaline drugs and lately through organotherapy (thyroidin, ovarine) has soon died away, and there only remains to us the operative removal of the pathological tissues as a rational means of cure."

The point which Freund especially insists upon is the limitation of the radical operation to uteri which are movable and which have not given metastases, demonstrable by physical examination, to the neighboring tissues. The wide involvement of the broad ligament he believes is a positive contraindication to any attempt at radical cure, and if palliative operative measures are at all advisable these are the cases which should be subjected to vaginal hysterectomy. (Personal communication.)

Along the line of improvement in the radical hysterectomy for carcinoma, the suggestion of Werder, of Pittsburg, appears worthy of careful consideration and trial, for if it can be carried out successfully it offers still better chances for the wide excision of the vagina.

In this operation the broad ligaments and pelvic attachments of the

uterus are severed from above through an abdominal incision. The dissection and freeing of the vagina are made from above in very much the same way as described in other radical operations. Having completed the dissection and controlled the hemorrhage, the uterus and its appendages are pushed down into the vagina, and the peritoneum is whipped over the raw areas made by the excision.

The patient is then lowered from the Trendelenburg position and placed in the lithotomy posture. The uterus is grasped with volsella forceps, is drawn down outside of the vulva, and the inverted vagina is amputated with the thermo-cautery. In the concluding technique the raw pelvic cavity is lightly packed with gauze.

As yet Werder¹ has only reported one case. In a personal communication of very recent date, however, he says he has now operated upon five cases with two deaths. In both fatal cases the cause of death was shock; one patient had valvular disease, and the other Bright's disease, and according to Werder's statement neither should have been operated upon for the disease proved to have been too far advanced.

If this modification of Werder's is limited to the operable cases which offer a reasonable chance for permanent cure, I believe it will prove to be a valuable addition to the technique of the radical operation. In any case Freund's warning not to attempt any radical measure when the disease is far advanced should be held constantly in mind.

FOREIGN BODIES ACCIDENTALLY LEFT IN THE ABDOMINAL CAVITY.

The possibility of leaving a sponge or small instrument in the peritoneal cavity is by no means the smallest risk which the abdominal surgeon runs in the course of his work. In the hurry of a large clinical service where resident physicians are being changed every few months, or under the stress of conditions incident to an operation in the country where the surgeon must depend upon strange and inexperienced assistants, it is surprising that a larger number of such accidents do not occur.

That the most experienced operator may have this ill luck befall him is again shown by the report of Boldt,² of New York, by whom a gauze sponge was left in the abdominal cavity on two occasions.

In one case a piece of gauze was left behind, which was passed some two months later by the rectum, followed by recovery of the patient. In a second case of suprapubic hysteromyomectomy a gauze pad which was overlooked gave rise some months later to symptoms of obstruction. An operation for the obstruction, which was supposed to be due to

¹ American Journal of Obstetrics, 1898, No. 3.

² American Gynecological and Obstetrical Journal, 1898.

intestinal adhesions, the true cause being wholly unsuspected, revealed the gauze, which had worked its way into the intestine, but could not be expelled through that channel. Resection of the injured intestine resulted in death.

On reviewing the literature for similar accidents Boldt found reports of two cases by MacLaren, in the first of which a gauze pad, left behind, was later passed by the bowel, with recovery of the patient; in a second case an artery clamp was removed from the lumbar region of the peritoneal cavity two years after operation for a myomatous tumor. In a case reported by a French writer (anonymous) a piece of gauze 26 cm. in length, folded four times upon itself, was passed per rectum and, strange to say, the perforation of the pad into the bowel and its discharge were not attended by marked symptoms.

M. Salin reports an instance where a gauze pad was discharged through the anterior abdominal wall one year after the primary operation, and gave rise to a fecal fistula, which, however, healed spontaneously. Elsner, of Syracuse, also reports a case operated upon by a prominent New York gynecologist, in which a gauze sponge was left behind and passed six months later per rectum. Coe, of New York, knows of five cases which died from septic peritonitis originating from this source.

In view of the fact that only a small minority of these cases have been published, the frequency of this accident is little less than appalling. From the ethical stand-point a case related to me by a prominent gynecologist of the West is quite unique. A patient had been operated upon for some abdominal disease by another surgeon, but as she was not relieved she finally applied to the second surgeon for treatment, who, upon examination, found a foreign body, posterior to the uterus in Douglas' cul-de-sac, which felt so much like a seal finger-ring that he spoke of the resemblance to the patient. On her return home from this consultation she at once interviewed the nurse who had attended her during her operation and convalescence, from whom a most remarkable story was obtained. The first surgeon had discovered the loss of a seal-ring immediately after the operation, and the operating-room, pails, dressings, and even the drainage-pipes were searched in vain. At last he came to the conclusion that the missing ring must have dropped from his finger into the abdomen during the operation, and the patient was returned to the operating-table and the abdomen reopened, but to no purpose.

When the patient returned to the second surgeon with this story he felt convinced that he had located the long-lost ring, and an incision through the vaginal fornix confirmed his diagnosis. The amusing part of the story is that upon her recovery the patient offered the ring to its rightful owner, but he absolutely disclaimed all knowledge of it and

refused to accept it. As a grateful remembrance, she then presented it to the second surgeon.

Boldt's cases were certainly not reported as mere surgical accidents, but as a warning to others, and he therefore deserves great credit for revealing these mistakes. The warning is well timed, for in the hurry of our large clinics, unless an inflexible rule is observed in the care of sponges, this accident may be of frequent occurrence.

For the purpose of walling off the peritoneal cavity during operation Boldt advises the use of towels or long strips of gauze with forceps attached to the projecting ends. In order to prevent future accidents he has inaugurated certain rules to which the closest adherence is required.

No pad of those counted for operation is permitted to be torn or cut to meet an emergency. No pads are allowed to be thrown on the floor, but must all be placed in a receptacle for that purpose. All pads and forceps must be controlled by double count before beginning and at the conclusion of an operation.

To further insure the surgeon against this accident the reviewer would suggest that a reliable assistant should be detailed to look after the sponges, and before the incision is closed he should invariably be asked to verify his count to the entire satisfaction of the surgeon. To prevent confusion, a standard number of sponges or pads should be counted out for each operation, and in case extra sponges are required the same plan should be followed. By adhering to these rules this accident should never occur.

With regard to the disposal of foreign bodies in the abdomen, it appears that they are first encapsulated, and then tend to work toward the abdominal parietes or a viscus.

It is really remarkable how frequently even large objects have been discharged into the intestine and passed by the rectum.

ABDOMINAL AND VAGINAL HYSTERECTOMY.

Although there is hardly a gynecological society in this country which has not during the last year been a forum for the debate of the question of vaginal *versus* abdominal hysterectomy, practically nothing has been added to either side of the question.

The lively discussion of three years ago, incited by Jacobs' paper before the American Gynecological Association, and the active work of Polk and others previous to that event, brought out all the vital points at issue.

Those who stood as the active champions of the one or the other method at that time hold essentially the same position to-day.

The one writer of the last year who has, perhaps, been the most ener-

getic supporter of vaginal hysterectomy is W. R. Pryor,¹ of New York. He has adopted the general principle embodied in the operations of Landau, of Berlin, and Doyen, of Paris. The chief points of variation from the usual clamp or ligature method of vaginal hysterectomy are the sagittal or hemisection of the uterus and the delivery of each half into the vagina before the clamps or ligatures are applied. By this manœuvre the appendages are much more easily enucleated, and the operation is greatly facilitated by the absence of clamps, which so impede the operation when the broad ligament is first clamped as in other operations.

The usual plan of conducting the operation is to open both the utero-vesical plica and Douglas' pouch, after which the cervix is caught with strong tenaculum forceps or by Pryor's special intra-uterine tractor. The uterus is then bisected in the median line, the bleeding being, as a rule, so insignificant as not to require clamps. Having completely divided the uterus, one-half after the other is drawn down into the vagina; adhesions are broken up, and the heavy-jawed crushing clamps are applied to the broad ligament.

During the last year a very spirited passage-at-arms has occurred between Doyen and Tuffier,² concerning the question of priority in the invention of a special crushing forceps, through the employment of which it is claimed that a bloodless operation may be performed without the usual clamps or ligatures. Doyen styles this method of controlling hemorrhage, *angiotripsie*.

With regard to all operations which propose to do away with the ligation or clamping of vessels, it seems to me one can unhesitatingly condemn them. Ligation is too great an assurance of safety to be discarded from any operation, and notwithstanding the brilliancy in the achievement of this so-called *angiotripsie*, the risks are certainly too great for any possible gain secured.

The reviewer, in a considerable experience in the clinics abroad during the year 1898, saw many vaginal operations, but, instead of being impressed favorably, was prejudiced against them.

In the limited number of conditions in which he may feel justified in resorting to vaginal hysterectomy, the methods of Doyen and Landau, in which the uterus is bisected, will certainly be adopted, for they present decided advantage over the older methods of vaginal hysterectomy. In no instance, however, will ligatures be discarded for clamps or *angiotripsie*.

¹ American Journal of Obstetrics, 1898.

² Revue de Gynécologie et de Chirurgie Abdominale, July-August, and September-October, 1898.

ULTIMATE RESULTS IN VAGINAL HYSTERECTOMY FOR INFLAMMATORY DISEASE.

Buschbeck,¹ first assistant to Leopold, reviews the after history of patients upon whom vaginal hysterectomy has been performed in the Dresden Gynecological Clinic, from 1885 to 1897, for grave chronic inflammatory disease of the appendages.

Sixty-seven patients in all were operated upon, and these were selected from 550 patients in the hospital and 800 patients in the polyclinic. Many women were relieved of their symptoms through a slow and very tedious local treatment, while others were subjected to conservative operations in which only one ovary and tube were removed. From Buschbeck's report it would appear that a very conservative and commendable course has been pursued in selecting the cases for operation, and we may, therefore, look with much interest upon the final results.

The cases selected represented the most serious, or at least the most persistent, forms of inflammatory diseases, for they usually suffer not only from the chronic inflammation *per se*, but from its after-effects, such as dense adhesions, which derange the functions not only of the pelvic, but also of the neighboring organs. In my experience, this class of cases, so far as permanent cure or even the relief of symptoms is concerned, is usually the most unsatisfactory of all.

Buschbeck says the majority of cases entering the Dresden clinic are working women, who depend upon their work for their living, and, consequently, desire the most certain and quickest methods of cure.

In severe chronic cases the vaginal method appears, therefore, to have been chosen by Leopold and his assistant as the most effective one.

The conclusions which Buschbeck reaches concerning the ultimate results are as follows :

1. Of the 67 patients operated upon for chronic diseases of the appendages, 1 patient died (1.5 per cent. mortality).
2. Of 48 women who were heard from or seen personally, 43 were perfectly well (89.5 per cent.).
3. No injuries to health, such as fistulæ, pelvic exudations, scars, etc., were found in any case.
4. No serious symptoms or disturbances in the sexual relations were noted. Slight menstrual molimina occurred during the first months and years after the operation, but gradually disappeared.
5. In nervous and hysterical patients the removal of the diseased organs does not offer a certain assurance of the relief of the nervous symptoms.

¹ Archiv. für Gynaek, 1898, vol. lvi.

ULTIMATE RESULTS IN CASES OF VAGINAL HYSTEROMYOTOMY.

Buschbeck¹ also gives in addition to the foregoing report an instructive review of the results of 100 vaginal hysteromyomectomies. As a prefatory remark, he calls attention to the coincident occurrence of carcinoma with myoma which, although not frequent (3 cases out of 100), is of sufficient importance to be well worthy of attention. The derangement of the heart and general vascular system also has been made the subject of remark, for, after operation, death has not infrequently occurred from pulmonary emboli or from a cardiac affection, to which Buschbeck gives the name of myoma heart. The latter subject has been made the special study of Strassman and Lehman,² who lay very great stress upon the connection between heart disease and myoma uteri.

The especial attention of the readers of this review is called to Leopold's indications for the vaginal extirpation of myomata which Buschbeck has laid down in this article, because they are certainly subject to discussion. Buschbeck states that vaginal hysterectomy is indicated :

1. If, after the exhaustion of all other remedies, the growing tumor continues to give rise to hemorrhage, pain, pressure symptoms, inflammatory changes, degenerative processes which threaten the health and life of the patient.

2. If, after very careful examination the appendages are found too adherent to be enucleated.

3. If, the general condition of the patient is too critical for an abdominal operation.

From this stand-point the vaginal method was employed in 100 out of 363 myoma operations. Of the 100 cases 4 fatalities are recorded, 3 from the immediate effects of the operation, and 1 from hemorrhage from the gastro-duodenal artery produced by the erosion of a duodenal ulcer.

The results of the record of the series of 90 (10 still in the clinic) cases are as follows : 4 died in the clinic, 3 died later, 18 not heard from, 20 heard from through letters, and 45 returned for examination.

The subsequent history was obtained in 72 per cent. of the 90 cases, and 50 per cent. returned for examination. Of the three women who died subsequent to their discharge from the hospital, one committed suicide as a result of mental derangement, for which she had received psychiatric treatment before operation ; one died of general carcinoma,

¹ Ueberlick über 100 vaginale total extirpationen wegen Uterus myomen u. Nachprüfung d. Enderfolge dieser Operationen. Arch. f. Gynaek., Bd. lvi.

² Archiv. für Gynaek., vol. lvi. p. 503.

and the third from some unknown cause. The general condition of the 65 patients from whom intelligent answers were received, with very few exceptions, was altogether satisfactory. Of the 20 patients from whom written communications were received, 15 were entirely well; 2 complained of climacteric symptoms; 1 was not yet able to do heavy work; 1 suffered with gastric disturbances, but, so far as any abdominal complaint was concerned, was entirely well. The remaining patient still suffered with neurasthenia, her general condition, however, was good. From the ill effects of the hemorrhage all of the 65 patients had completely recovered and were again fully able to work.

In two cases sensitiveness in the vaginal scar was complained of, but none showed the slightest inflammatory condition in the remaining organs of the pelvis. In one case prolapse of the vagina had occurred, which, however, was retained without uncomfortable symptoms by means of a pessary.

Although Buschbeck considers the 45 patients who were examined as entirely healed, for the sake of thoroughness he has gone minutely into the post-operative history of these cases, and as a result finds that 35 are entirely free from any complaint, 3 had nervous symptoms of very mild degree, 1 suffered from gallstones, 1 from gastric pain, 2 from occasional dysuria, 1 from pruritus vulvæ, 1 from vaginal discharge, and 1 from backache after heavy work.

One very gratifying result of leaving the ovaries behind is that in no case was there any radical disturbance of either the menstrual or sexual functions.

As a result of this review, Buschbeck comes to the following conclusions:

1. Of the sixty-five women who were heard from through personal or written communications, all may be considered as permanently healed from the disease for which the operation was performed, are fully capable of working, and with the exception of the light symptoms above referred to are bodily and mentally well individuals.

The total mortality was 3 per cent. The ligature, instead of the clamp method, was exclusively employed.

As a precautionary remark Buschbeck says: "In order to complete the diagnosis, to definitely fix the indications for operation, and to render more certain the prognosis, the general circulatory apparatus should be examined most carefully in every case."

He also highly recommends the subcutaneous infusion of physiological saline solution as a valuable measure for strengthening and rendering the patient more able to withstand the effects of the operation.

I cannot pass this article over without a brief criticism of the indications for operation as laid down by Leopold. From statistics gathered

from various sources it must be granted, without further discussion, that the mortality following the vaginal and abdominal methods in the best hands are about equal. Starting on the basis, therefore, that so far as this point is concerned there is no preference of one over the other, I think the next most important point to be considered is the after-results in these cases.

The general conservative tendency which is now generally recognized in the gynecological world must call attention, with considerable emphasis, to the fact that except in submucous myomata there is little or no possibility of anything less than a radical operation by the vagina, whereas the abdominal incision permits a wider selection of measures consisting in a simple or multiple myomectomy, release of ovaries and tubes from adhesions, plastic operations upon the tubes to restore their patulosity, etc. In cases of myomata the influence of age plays a considerable rôle as to the method of operating, radical measures being expedient in a large percentage of cases, because many of these patients present themselves for treatment not far from the climacteric period, when the preservation of the child-bearing function need not be considered. With this question disposed of, it only remains to the operator to select the easiest and safest operation which usually is abdominal hysterectomy. Concerning the choice of methods in these cases I see no advantage in electing the vaginal over the abdominal; on the contrary, the exact opposite appears more in accord with the best surgical principles. By employment of the abdominal operation described by Pryor and Kelly densely adherent tumors may be removed with the greatest ease and freedom from danger.

Shock, which is so frequently a factor in the discussion of the relative merits of the two operations, very seldom occurs in the hands of a skilled abdominal surgeon, and, therefore, cannot with justice be used as an argument against the method. In the interest of the best surgical principles, therefore, I am convinced that of myoma operations through the vagina a very narrow limitation is desirable.

ULTIMATE RESULTS IN ABDOMINAL HYSTEROMYOMECTOMY.

In view of the foregoing report of Buschbeck's, it is of much interest to compare Abel's¹ thorough review of sixty-five cases of abdominal hysteromyomectomy performed by Zweifel between the years 1887 and 1894. Looking at the result as recorded in Abel's paper, it is evident that he has made out a strong case in favor of the abdominal as opposed to the vaginal method, for he has personally seen and examined, subse-

¹ Archiv. f. Gynäkologie, vol. lviii. p. 261.

quent to operation, a much larger percentage of cases than has Buschbeck. For instance, Buschbeck has only heard from 72 per cent. and has seen but 50 per cent. of Leopold's patients, whereas Abel has definite information from every one of Zweifel's sixty-five patients.

The one fact which stands out more prominently than any other in this report is the radical cure effected by the operation, for of sixty-five patients sixty gave personal expression to their entire satisfaction with the result. In comparison with other gynecological operations I know of no one which gives more gratifying results.

The operation as performed by Zweifel is the simple supravaginal amputation of the uterus, with or without the removal of the cervix as the exigencies or indications of the case demand.

One of the chief questions in hysterectomy which has been discussed at length is the retention of the cervical stump. Among the objectors are Martin, Fritsch, and Jacobs. One disadvantage of the stump, according to Martin, is that the sutures become the seat of abscesses which keep up prolonged suppuration until they are all discharged. While admitting that the employment of catgut largely does away with this objection, he counts as still another equally disturbing post-operative complication, endometritis of varying severity, which he has many times observed in the stump.

Fritsch also argues in favor of total hysterectomy, holding that the retention of the cervical stump is primarily unnecessary because it offers no advantage to the patient, and, secondly, that the more radical operation is followed by a better and more rapid recovery, the healing of the wound being much more satisfactory.

As post-operative sequelæ of the partial operation, Fritsch enumerates the following: pain in defecation and urination, difficulty in walking and physical exertion, post-operative pelvic exudates, and chronic peritonitis. As a concluding statement, he says: "Without doubt total extirpation is the preferable operation; indeed, it is the method of the future."

In this instance Fritsch has undoubtedly proved a false prophet, for the partial operation has not only retained its original supporters, but has gained new champions. Concerning the post-operative exudate, Abel says it occurred in only nine of the sixty-five cases, and in only four cases was the recovery to any extent retarded by this complication.

While Abel does not attempt to deny this disadvantage, he says it is the single one which Fritsch names that has been noted in their cases. This point is too important to be passed without special comment, especially as I feel that even this last objection can practically be eliminated by a change from the Zweifel to a more modern technique. The more we see of the healing of wounds, the more we are convinced

of the dangers arising from the strangulation of large bits of tissue, such as occurs in the Zweifel operation through the transfixion and double ligation of the cervical stump. To Baer, of Philadelphia, is due the credit of eliminating this objection, for by ligating the uterine arteries lateral to the cervix he leaves the stump practically without ligature. This modification is undoubtedly a long step in advance of Zweifel's method. In a series of over 200 hysteromyomectomies under my observation in which the stump has been retained, post-operative exudates were of the rarest occurrence. To Fritsch's statement that the retention of the cervix is of no advantage to the patient, exception also may be taken, for it stands to reason that a closed pelvic floor not only shields the patient against the hernial-like prolapse of the intestines into the vagina, but also against the invasion of pyogenic organisms from the vagina.

In the way of complete cure, Abel says of all the patients examined by him, only four complained of the same symptoms after as before operation, and in each instance these difficulties arose from dysuria and constipation.

One of the serious post-operative sequels has been kolpitis induced through the removal of the ovaries. In such instances the vagina and introitus have participated in the climacteric involution to such an extent that the atrophic mucosa has become dry and chapped. This kolpitis is, as a rule, the result of excessive cohabitation or, as Abel puts it, "cohabitation insults," for it does not occur in single women or in women with relaxed vaginae.

The narrower the vaginal introitus the more extensive and aggravated the inflammation. This sequel followed in seven cases. That the kolpitis was primarily induced through endometritis, Abel says he can positively deny, and in reply to Martin's statement concerning the post-operative endometritis in the cervical stump, he says not one single instance was met with in his study.

In reply to Jacobs, who claims that he saw two cases of carcinoma of the stump while on his visit to America, which of itself should be a "death-blow" to the partial operation, Abel says he has seen no such sequel.

In two cases of subsequent sarcomatous involvement of the cervical stump reported by Menge and Welmer, the first was found to have been primarily sarcoma, while the second leaves grave doubts as to whether it was not also of the same nature. With the answer of each of these objections to the partial hysterectomy, Abel concludes that the stump plays no rôle in the production of untoward results or sequelæ.

With this careful review of the results of hysteromyomectomy by Abel, any doubt which may have existed as to the beneficial effects

accomplished by the operation can be laid aside, and the discussion upon this aspect of the subject should come to a rest. The new line now open, as already indicated by the trend of recent literature, is the development of the simple myomectomy, which leaves actively functioning ovaries and not only a uterus restored so as to be capable of carrying out its menstrual cycles, but not infrequently its child-bearing function.

CONSERVATIVE OPERATIONS UPON THE OVARIES AND TUBES.

Under this title Kelly¹ has devoted a chapter in his book, which is so complete as to leave little to be said upon the subject. The reasons for conservatism are laid down as follows :

1. That it is the general attitude of all true surgery.
2. The important uses and relation of the conserved structures to the human organism.
3. The recognition that what were once considered diseases of the tubes and ovaries are in many instances no disease at all.
4. The recognition that a disease of part of a structure, ovary, tube, or uterus, may only demand the removal of that portion which is diseased.
5. The discovery that in certain diseases an entire regeneration may take place and badly diseased tubes may again become normal in their functions.
6. On account of the value of the structures involved, ovary and tube are no longer removed *en masse* for purely technical reasons, but a diseased tube or part of a tube, a diseased ovary or part of an ovary, are removed by themselves, each without interfering with the other.

The first active worker in this line of conservatism was Dr. W. M. Polk, of New York, who as early as 1887 began to insist upon the retention of the ovaries and tubes in many cases in which they had previously been removed.

A. Palmer Dudley, of New York, has also been a very consistent advocate of this policy, and has reported some splendid operative results. Several papers have appeared by him upon this subject, and according to his latest statement, he has now 103 cases upon his list of conservative operations. From this number he has selected two very good examples of gonorrhoeal pyosalpinx, which have been reported during the last year.² In both instances the tubes were greatly distended with pus, and an extensive reparative operation was required to restore these organs to

¹ Operative Gynecology, vol. ii. p. 163.

² American Gynecological and Obstetrical Journal, October, 1898.

a condition justifying their retention. In both instances the subjective symptoms have passed away and the patients are apparently well.

Beyea¹ reports a case of parovarian cyst in which he was able to remove the cyst without the tube or ovary. This is the second case of this kind reported, and it is to be hoped that it will be a stimulus to others to follow in the same line, for Beyea has shown the operation to be perfectly feasible.

MYOMA UTERI TREATED BY MAMMARY AND THYROID EXTRACT.

During the last five years organo-therapy has taken a very prominent place in the treatment of various diseases. The value of ovarine has been demonstrated in a limited number of cases of climacteric disturbances, and it would appear from Polk's experience with thyroid extract and Shober's with mammary extract, that these remedies may hold some promise of good results in the treatment of myoma uteri. As yet definite observations have not been made in a sufficient number of cases to warrant a prophecy as to the value of these remedies. Polk believes he has seen good results from the administration of thyroid extract, while Shober,² of Philadelphia, on the basis of four cases treated with the extract of mammary gland, thinks his results justify his recommendation of the remedy.

If the indications for operation are not urgent these extracts should by all means be given a fair trial. When the symptoms become threatening, however, it would be bad policy to pursue this line of treatment to the exclusion of operation, which we know presents such a splendid chance for cure.

¹ American Journal of Obstetrics, March, 1898.

² Loc. cit.

DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE SPLEEN, THYROID GLAND, AND LYMPHATIC SYSTEM.

By ALFRED STENGEL, M.D.

THERE are no departments of medicine in which as great advances have been made in recent years as in those named at the head of this article. More than this, these subjects still afford constantly widening fields for exploration, and in them a large number of physiologists, pathologists, and clinicians are constantly at work. Not only have the studies so far made greatly improved our knowledge of the functions of parts heretofore but little understood, but they have added very greatly to our ability to treat many diseases with success and scientific skill which in the past had been treated unsuccessfully and on empirical grounds only.

THE BLOOD.

Staining. But little has been added to our previous knowledge regarding methods of examining the blood. The methods of Ehrlich, that have rendered morphologic studies of the corpuscles so productive, have been little improved in recent years, and most of the newer methods have nothing but their novelty to commend them. For all practical purposes one or two staining-methods now in general use suffice to demonstrate the facts that are of clinical value. I shall not, therefore, review the literature dealing with the various new stains.

Alkalinity of the Blood. More useful results will undoubtedly be obtained by those who labor to devise methods for the ready determination of changes in the chemical and physical properties of the blood. For example, the alkalinity of the blood is undoubtedly a matter of some importance, though the discoveries have thus far been meagre. More important facts may not unlikely be discovered when better methods are suggested. Hitherto different investigators have employed widely divergent methods. A new one is now suggested by Salkowski,¹ who dissolves 20 grains of finely pulverized ammonium sulphate, of neutral reaction, after placing it in the glass vessel of

¹ Centralblatt f. diemed. Wissensch., December 24, 1898.

Schlösing's apparatus, by the addition of 20 c.c. of water. A measured quantity of blood is then added (10 to 25 c.c.). Then 10 c.c. of a one-tenth or one-quarter normal acid solution are placed in the acid vessel of the apparatus, and after allowing the apparatus to stand five or six days, the acid is titrated with a one-tenth or one-quarter normal soda solution. The original acid solution has in the meanwhile become neutralized to a variable degree by the ammonia set free in the mixture of blood and ammonium sulphate, and the loss in acidity represents the quantity of ammonia. The alkalinity of pigs' blood estimated in this manner was 0.252 of NaHO, and of rabbits' blood 0.214. The author does not pretend to determine the relationship of the results he obtained with those determined by other methods.

One disadvantage of this method is the length of time which the apparatus must be allowed to stand, but this is unavoidable. Five to six days is sufficient, though a little ammonium is eliminated even later. That the preformed ammonium of the blood may cause an error is another possible objection, but the author points out that this error must be very slight, as von Nencki has shown that this amounts to but 1 to 2 mg. in 100 c.c. of blood. Salkowski suggests that this error might be obviated by treating the blood with proper neutral salts or with anti-septic substances, and then setting it aside in the Schlösing apparatus to allow the ammonium to evolve. In this procedure the quantity of ammonia is so small that it probably would be best estimated by Nissler's reagent. This method may be found useful in laboratory studies, but is obviously too complicated and difficult for the ordinary clinician. Some of the older methods are doubtless more satisfactory.

C. S. Engel¹ has modified the Loewy-Zuntz method for estimating the alkalinity of the blood. The modification consists in the use of a very dilute solution of tartaric acid, one-seventy-fifth normal. He uses lacmoid paper as his indicator, and stops the titrations when the drop of liquid being titrated causes a bright red line around the edge of the drop.

Estimation of Iron and Hæmoglobin. Objections have been urged against the various methods of determining the amount of hæmoglobin, and indirect methods have recently received some attention. Among these may be cited the methods of determining the amount of iron in the blood and those which show the specific gravity. Jolles² described a method for estimating the amount of iron, and has recently recorded three cases in which the amount of iron in the blood was measured by his method and by gravimetric analysis. The difference was only from 2 to 6 per cent. The method, therefore, seems to be satisfactory.

¹ Berl. klin. Wochenschrift, April 4, 11, 1898.

² Deutsche med. Wochenschrift, February 17, 1898.

It must not be forgotten, however, that all of the iron of the blood is not contained in the hæmoglobin. This point is elaborated by the following studies :

S. Jellinek¹ has made comparative studies of the amount of coloring matter and of iron contained in the blood, particularly investigating the question as to whether the entire quantity of iron in the blood is contained in the hæmoglobin, and as to whether the latter substance is the only one which contributes to the color of the blood. His estimations of the amount of iron were made with Jolles's ferrometer, and the hæmoglobin was estimated with the Fleischl instrument. Sixty comparative estimations are recorded, ten of them upon healthy persons and fifty on individuals with various illnesses. In the ten healthy individuals the two instruments indicated the same amount of iron in two cases, but four times the ferrometer gave the higher results, and four times the hæmoglobinometer. It did not seem, therefore, that the latter instrument could be depended upon for indicating the amount of iron in the blood. In chlorosis the ferrometer showed that the amount of iron in the blood was reduced, and also that there was a reduction of the amount in each corpuscle ; when improvement occurred this was shown earlier by the ferrometer than by the hæmoglobinometer. The treatment of many of these cases with preparations of organic iron gave unsatisfactory results as far as any distinct improvement in the condition of the blood was concerned. Various secondary anæmias showed much higher results by the hæmoglobinometer than by the ferrometer. In some of the cases this was due to the presence of icterus, the biliary pigments causing the blood to appear darker in the hæmoglobinometer. The combined method of examining the blood was a very definite test of the progress of the jaundice. The amount of iron in the blood remained entirely constant throughout the course of four severe cases of icterus. In two cases which presented leucocytosis the ferrometer gave low readings. In several cases of diabetes the amount of iron in the blood decreased constantly, although the readings with the hæmoglobinometer were higher. In a case of malaria the amount of iron was found the same after the chill as before, though the hæmoglobinometer gave varying results. The conclusion to which Jellinek comes is that examination of the blood by a single method is insufficient, and that both the iron and the hæmoglobin should be estimated. He considers Jolles's instrument entirely suitable to clinical purposes and of quite sufficient accuracy.

Another method is described by W. Mackey,² in which the quantity of iron in a measured drop of blood is estimated. The method depends upon a comparison of colors in a control solution and in the preparation

¹ Wiener klin. Wochenschrift, August 18, 25, 1898

² Lancet, January 22, 1898.

of the blood. Forty c.mm. of blood are drawn into a graduated pipette and carefully distributed in a platinum dish. The blood is dried and heated to an ash which is dissolved in hydrochloric acid, and 1 c.cm. of a 4 per cent. potassium solution of sulpho-cyanate added. The whole liquid is then diluted to 10 c.cm. and placed in a cylinder. In a similar cylinder 5 c.cm. of strong hydrochloric acid and 1 c.cm. of sulpho-cyanate solution are diluted to 15 c.cm., and a standard solution of iron added until the color in the two cylinders is the same. Twelve estimations in normal persons gave an average of 6.3 parts of iron in 10,000 of blood, and 13.46 per cent. by weight, as the average amount of hæmoglobin. It was found that the amount of iron multiplied by 11 gives approximately the percentage of hæmoglobin, according to Gowers. The method is applicable also to other liquids.

Specific Gravity. The methods of determining the specific gravity of the blood are old and more or less established. There is still need, however, for a useful clinical method that is reliable. Notwithstanding the allegations of those who have worked with Hammerschlag's method, and others of a similar nature, the reliability of these is very doubtful. With care in their performance fairly useful results may, however, be obtained, and it is of interest to learn what relations these results bear to the richness of the blood. Dr. Cora L. Lichty¹ has contributed a study of Hammerschlag's method, her plan of procedure being as follows: A test-tube about 25 mm. in diameter is filled two-thirds full with a mixture of chloroform and benzol, the specific gravity being between 1056 and 1060. After cleansing and pricking the finger or ear, a drop of blood is drawn into the white corpuscle pipette, and then gently blown out into the middle of the mixture. Then the lighter or heavier liquid is added until the blood floats, care being taken that the drop is not broken as the fluids are mingled. The first work done by the author was with benzine, as no benzol was at hand, but this did not prove satisfactory. Gasoline was next substituted, and was somewhat better. Change, however, occurs on standing. Pure benzol was next used, and while it was notable that greater care was required to avoid breaking the drop of blood, in every other respect this liquid answered the best. Over one hundred cases were tested, and the author gives her results in a tabulated form as follows:

Specific gravity.	Hæmoglobin.
1035-1038	25-30 per cent.
1038-1043	30-40 " "
1043-1045	40-45 " "
1045-1047	45-50 " "
1047-1049	50-55 " "
1049-1052	55-65 " "

¹ Philadelphia Medical Journal, July 30, 1898.

Specific gravity.	Hæmoglobin.
1052-1054	65-70 per cent.
1054-1056	70-75 " "
1056-1060	75-85 " "
1060-1063	85-95 " "
1063-1065	95-100 " "

Sometimes the results obtained were very different from the usual ratio, but the author believes the error lies with the Fleischl instrument rather than with the specific-gravity method.

Fixing Blood Films. W. K. Hunter¹ describes his method of fixing blood films. He passes them through a flame, and then puts them in a 70 per cent. alcohol solution. He has been able to stain the granules of the marrow cells either with eosin or methylene-blue, according to the amount of stain in the mixture, and he concludes that these granules are in reality amphophile. He agrees with Gulland in regarding the granules as the knots in the network of the stroma.

The Blood Elements. Studies of the morphology of the blood under various conditions have multiplied in recent years, and have led to the solution of some important questions. It is desirable, however, that more accurate investigations of the relations of the chemical and physical properties of the serum to the morphology of the corpuscles should be conducted. The view has been expressed by some authorities, and is receiving increased attention of late, that changes in the serum are the primary cause of many of the corpuscular features of anæmia.

The Volume and Form of the Red Corpuscles. Of interest in this connection are the studies of H. J. Hamburger,² who has investigated the effect of respiratory exchange of gas upon the volume and form of the red corpuscles. In the first place, he investigated the swelling of the red corpuscles, caused by the action of carbonic acid gas, taking the simple volume of the precipitated corpuscles by using a centrifugal apparatus, and estimating the exact volume of the corpuscles by Eykmann's method. He found that the cells increased in size on the addition of pure carbonic acid gas or of gas mixtures containing 5 per cent. of carbon dioxide. The normal venous blood contains larger corpuscles than the arterial. The micrometric determination seemed to indicate a diminution of the venous corpuscles, but this is caused by the fact that the corpuscles assume a spherical shape, and, therefore, appear smaller. The elliptical corpuscles of birds' blood, he found, have a tendency to become spherical under the condition named. The explanation of these phenomena, offered by the author, resembles that arrived at by Lehmann, Loewy, and Zuntz, namely, that the non-diffusible alkaline albuminate of the blood is destroyed by the carbon dioxide, and diffusible

¹ Glasgow Medical Journal, May, 1898.

² Zeitschr. f. Biol., xxxv., S. 252.

carbonate is produced. In consequence the osmotic tension of the serum and of the corpuscles is increased (that of the corpuscles, however, in greater measure), and the latter consequently absorb water from the serum. These facts are also substantiated by Hamburger's previous discovery that the venous corpuscles are destroyed in more concentrated saline solutions than are the arterial.

H. Dominici¹ notes that mild degrees of experimental septicæmia in animals cause the appearance in the bone-marrow of nucleated red corpuscles without marked anæmia. He has investigated this question in adult human beings, examining eighteen adults who had various infections, and has found in their bone-marrow various forms of myeloplaxes, numerous large mononuclear elements, and red corpuscles presenting single nuclei. He has also assured himself that although nucleated red corpuscles are found but rarely in the circulating blood in septicæmia, they do, nevertheless, appear there at times.

The Origin and Classification of the Leucocytes. The leucocytic problem is by no means settled, and the origin of the various forms of cells remains to be determined. H. Weiss,² in discussing the question, states that it is impossible to indicate the place of origin of any particular sort of leucocytes, and no form is significant of activities in special parts of the body. As a part or outcome of this large question, we may refer to a less important one, the classification of leucocytes. I call this less important because it is dependent for its ultimate solution upon the determination of the origin of the different types. Ehrlich's classifications are still the most satisfactory because they are simple and for the most part based upon readily ascertainable data. In some cases the teachings of Ehrlich must unquestionably be modified, as in the case of the elective affinity of granulations in the blood. The following abstract will indicate the point I wish to make, and from my own experience the author is supported by many facts.

P. Borissoff³ has made some investigations of the correctness of the terms neutrophile and amphophile proposed by Ehrlich in describing the granulations of the leucocytes. He stained the blood of various animals and of human beings by different basic and acid stains, and by mixtures of these, and has reached the conclusion that the neutrophiles are in reality oxyophiles, and that the coloring material in the triacid mixtures is in reality acid. The amphophiles are sometimes stained by alkaline stains, but always by acid stains, while with a mixture of acids and alkalis they always take the acid dye, so that they are also really oxyophiles. Borissoff has further determined that in various species of

¹ *Comptes-Rendus de la Soc. de Biol.*, November 19, 1898.

² *Wiener klin. Wochenschrift*, January 20, 1898.

³ *Gaz. Hebdom. de med. et de Chir.*, September 15, 1898.

animals as well as in man the protoplasm of the leucocytes always gives a reaction with acid colors, while the nucleus takes the basic dyes. Therefore, the protoplasm and its granulations have the properties of bases, while the nucleus has the properties of acids.

Influence of Various Physical Conditions. The determination of the influence various physical conditions exercise upon the composition of the blood is most necessary to a proper understanding of the alterations met with in certain diseases. The effects of increased and decreased blood-pressure, of alterations in the excretion of water, of heat and of cold, of food and drink, and other conditions, enter into the establishment of various states of the blood met with in disease. In the earlier days of hæmatology authors were accustomed to ascribe the condition of the blood entirely to the disease under observation, without taking the above-named factors into consideration. In recent years this has been to a great extent remedied, and investigators are disposed to view the matter more broadly.

W. Schwinge¹ has instituted investigations concerning the amount of hæmoglobin in the red corpuscles, the number of these corpuscles, and the number of white corpuscles in various stages of life and under various physiological conditions. He includes with his own studies a careful review of the work of others, and his results are summarized as follows: The amount of hæmoglobin and the number of red corpuscles varies in the different periods of life. Directly after birth both hæmoglobin and red corpuscles are present in greatest amount. From this time there is a decrease which, after the first year and during the period of growth, is replaced by an increase that is subject to periodic variations, but reaches its highest point between the thirtieth and fiftieth years; there is, again, a decrease during the latter end of life. The number of leucocytes, on the contrary, decreases during the active period of growth, to increase in the latter part of life. There are differences to be seen between the two sexes. During the period of sexual activity females show smaller counts and a lesser amount of hæmoglobin than do men, while after the climacteric the conditions in the two sexes become almost the same. The reasons for the difference seen in the two sexes are not wholly clear, but probably a certain amount of it is due to the fact that females, as a rule, take relatively less nourishment than do males, the effect of ingestion of food being to increase the hæmoglobin and corpuscles. In Schwinge's estimations the red corpuscles reached the maximum directly after the meal, the count remaining high for some hours, then decreasing rapidly to increase again later, while the hæmoglobin increased rapidly, fell very rapidly, and reached its minimum within

¹ Pflüger's Archiv, Band lxxiii., Heft 7, 8.

an hour after meals. Another cause of the lesser amount of hæmoglobin and lesser number of red corpuscles in women is probably to be found in the loss of blood in menstruation. Pregnancy does not seem to cause any anæmia, but in one case examined by Schwinge lactation, under normal circumstances and not carried beyond the normal period, seemed to produce a moderate anæmia; he suggests that it is possible that lactation is an element in reducing the blood-counts of females. At any rate the variations in metabolism in the two sexes are of importance in explaining the difference in their blood-counts.

As to the variation at different ages, probably the most important cause is the change in the relative concentration of the body fluids and of the blood rather than active changes in the total amount of the constituents of the blood. Such changes in the concentration of the blood may be observed in the new-born, the high blood-counts found in them being largely due to a relative thickening of the blood, owing to the tissues taking up water to replace that lost in the first days of the establishment of the functions of respiration and perspiration. In the following early days of life this loss of water from the blood to the tissues is replaced by the ingestion of a sufficient amount of fluids.

It is also difficult to conceive of any other cause for the sudden striking variations in blood-counts, in normal individuals, than differences in the osmosis from bloodvessels to the tissue. Probably such variations in the concentration of the tissue fluids and of the blood, relatively to each other, are of greatest importance in explaining the differences in concentration in the advanced periods of life, the body tissues abstracting relatively more water from the blood in the later periods of life. The high counts of leucocytes which are found in youth are possibly due to an especially active formation of these corpuscles.

Edgecomb¹ has investigated the effects of exercise upon the hæmoglobin, especially with regard to the value of rest in the treatment of anæmia, and among his conclusions are the following: There is a normal daily and nightly rise in the corpuscular value representing daily destruction and formation of hæmoglobin. Active exercise, of course, increases the wear and tear. It also stimulates a slight overproduction of hæmoglobin. Passive exercise, such as massage, decreases the volume of the blood, but has no effect in diminishing or increasing the amount of hæmoglobin. Rest reduces the extent of the daily fall in consequence of diminished destruction. Edgecomb's studies were made in a healthy subject, and he suggests that they should be supplemented by observations upon anæmic persons. The constructive process would naturally be less active in the latter, but the rest, by removing drain, would enable

¹ British Medical Journal, June 25, 1898.

the constructive to gain upon and perhaps exceed the destructive, changes. In connection with these studies it is not improper to recall the fact that certain investigators, notably Mitchell, have found that massage increases the corpuscular richness of the blood, most probably by sweeping idle corpuscles into the circulation. The same condition not improbably occurs in other forms of exercise.

Polycythæmia. The importance of determining the influence of physical conditions upon the state of the blood is well exemplified in the case of polycythæmia. Authors are still at variance regarding this matter, though the opinion seems to be growing that the increased number of corpuscles under various conditions is due to the manner of distribution of the corpuscles throughout the body, rather than to increased production.

A. Constantin¹ has made a study of polycythæmia, which he divides into the relative and true varieties. He believes that the latter is frequent, and he especially notes the effect of dyspnœa in increasing the number of red corpuscles. Relative increase of the red corpuscles may be observed in almost any instance of excess in watery excretion or increase in normal secretions that are largely composed of water. A notable example of this is the stage of re-formation of an abdominal exudate after the fluid has been removed by aspiration; it may also be observed during a marked urinary crisis in infectious disease. Constantin notes the inutility of making blood-counts by extracting blood from œdematous extremities, since the œdema compresses the peripheral vessels and causes a local increase of the red cells.

A distinction of relative and true polycythæmia will not find favor with authorities in general, for even though it be admitted that there may be actual increase of corpuscles in some cases, there is no practical advantage in the classification, and in individual cases the determination of the form under observation would be impossible.

Stengel,² in discussing the condition of the blood in cardio-vascular disorders, expresses the view that polycythæmia observed in dwellers of high altitudes is caused by alterations in the distribution in the blood rather than by increased production, while Gottstein³ states that increase in the number of red corpuscles at high altitudes is due to an influence upon the blood and hæmoglobin, as well as to changes caused by the air-pressure upon the counting apparatus.

Gilbert and Garnier⁴ found the blood thickened after removal of a large collection of fluid from serous cavities. There results from such

¹ Thèse de Paris, 1897-98.

² Proc. Pathological Society of Philadelphia, March 15, 1898.

³ Berl. klin. Wochenschrift, May 23, 1898.

⁴ Gaz. Hebdom. de Méd. et de Chir., February 3, 1898.

an operation a serous anæmia, and this they believe is the cause of death in many cases of repeated tapping.

Hæmolysis. Undoubtedly extreme cold is capable of producing destructive changes in the red blood-corpuscles, and this fact has been used in explanation of the occurrence of paroxysmal hæmoglobinuria after exposure. Further, it is highly probable that exposure interferes with bodily functions to the disadvantage of the organism, including the blood, though the immediate relationship of moderate exposure to active blood destruction is less certainly established than some would have us think.

Carrière,¹ for example, in studying the effects of cold upon the blood, noted that the red corpuscles became greatly diminished in functional activity, that the hæmoglobin to a large extent becomes dissolved in the serum, and the latter is more toxic than normal. Intestinal antiseptics had no effect, and the author concludes that the changes in the blood are due to the retention of poisonous substances which should be eliminated through the skin.

Thomas² has investigated the effect of certain narcotic substances upon the blood-corpuscles, the alkalinity of the blood, and the gases in the blood. He showed that after giving alcohol to a rabbit the animal would die of an unusually small dose of cholera germs, and this was attributed to a lessening of the bactericidal action of the blood. He has, therefore, studied the action of ether, chloroform, and alcohol upon the constituents of the blood. Acute intoxication with alcohol caused a marked lessening of the alkalinity of the carbon dioxide, the volatile fatty acids increasing at the expense of the latter. The red corpuscles are sometimes decreased, sometimes not. Chronic alcoholism after several months causes reduction of the carbon dioxide and oxygen, while the alkalinity remains about normal. Ether, morphine, and chloral, when injected subcutaneously, caused a diminution of the oxygen of the blood, while the carbon dioxide and the alkalinity were not distinctly changed. When ether was inhaled carbon dioxide was present in increased amount, while the oxygen was lessened, the alkalinity unchanged, and the number of red corpuscles increased to almost double the normal amount. This was believed to be due to the fact that the blood becomes venous and somewhat thickened from the insufficiency of oxygen. Chloroform caused a lessening of the alkalinity of the blood.

Composition of the Various Elements. Many of the chemical studies of the blood are of comparatively little practical value at the present time, but deserve attention, nevertheless. A mass of facts has been accumulated, and is being accumulated, that will some time prove

¹ Bull. de l'Acad. de Méd., February 18, 1898.

² Archiv f. Exper. Path. u. Pharmacol., Band. xli., Heft 1.

valuable. I have already spoken of the methods of determining the alkalinity of the blood. Different investigators have followed different methods, but up to the present time little useful information has been obtained. This, however, does not demonstrate the uselessness of the work done; the future may furnish interpretations of points now obscure.

Abderhalden¹ contributes an article on the comparative analysis of the blood in various animals. The blood-serum showed a remarkably constant composition, especially within the same species of animals. The blood-corpuscles contain neither sugar, fat, nor calcium, and probably no fatty acids. The alkaline constituent of the blood-corpuscles showed a variability in the several species. In the carnivora and ruminants sodium was present in the corpuscles, but was absent in the horse, pig, and rabbit. It is noted that in the ruminant there is a great need for salt, while horses, pigs, and rabbits show no such craving or need. The carnivora find sufficient sodium chloride in their animal diet. Calculating the quantity of alkali in the blood-corpuscles as oxide of calcium, and subtracting from this the amount of calcium combined with chlorine and phosphoric acid, we obtain the amount combined with carbonic acid and albumin, and if this is compared with the quantity of hæmoglobin, we know that there is a parallelism. The larger amount of hæmoglobin was found in rabbits, being 33.195 per 1000 parts of red blood-corpuscles; the smallest percentage was in a horse, and was 31.508 per 1000. The phosphoric acid showed a considerable variability in some animals, being considerably lower in the ruminants than in the carnivora and others. Abderhalden tried to determine whether there was any iron combination in the blood beside hæmoglobin, and came to the conclusion that the amount of iron in any other form is exceedingly small, if there is any. Finally, the author calls attention to the similarity of the blood composition of the three ruminants examined, and, on the other hand, of the two carnivorous animals. It was found that the pig, according to its composition of blood, is more closely related to the horse than to the ruminant animals.

Th. Pfeiffer² has investigated the quantity of fibrin in the blood of man, and the relations of this to the crusta phlogistica. The method employed was that previously reported by himself and Koster. The normal variation of the fibrin, according to these examinations, is considerable, being between 20.8 mg. and 45 mg. nitrogen per 100 c.cm. of plasma. The average is 39 mg. In diseases he distinguishes two types, the first being that in which the quantity of nitrogen is about normal, as in typhoid fever, malaria, uræmia, and sepsis without suppuration; the second type is that in which there is increased quantity of nitrogen, as

¹ Zeitschr. f. Physiol. Chem., xxv., S. 65.

² Zeitschr. f. klin. Med., vol. xxxiii., S. 215.

in pneumonia, rheumatism, erysipelas, and peritonitis. It is of interest to note that the discovery of increased quantities of fibrin in pneumonia and rheumatism corresponds with the beliefs of the older physicians of the humoral school. The author further points out that in all diseases in which there is increased fibrin, inflammatory leucocytosis is discovered. He was never able to demonstrate hyperinosis without accompanying leucocytosis. With regard to the development of the crusta phlogistica, he points out that the time required for the development of the clot is important. The blood of patients suffering from inflammatory diseases coagulates more slowly than normal. At the same time the blood-corpuscles settle more quickly than normal, which is probably due to the alterations in the specific gravity of the corpuscles, or of the plasma, or both. In ten investigations to determine the relative specific gravity of the several components he found that this was not due to increased specific gravity of the corpuscles. Next he investigated the viscosity of the fluid of the blood, using Ostwald's apparatus, but this investigation gave no explanation for the rapid sinking of the blood-corpuscles, and he expresses himself as being of the opinion that the presence of a large quantity of fibrin factors is important in causing rapid sedimentation of the corpuscles.

C. Delezene¹ has instituted further studies concerning the mechanism of action of anticoagulant bodies, particularly of the peptone group. He believes that there are two especial elements at work in the prevention of coagulation; these are the leucocytes and the cells of the liver. That the liver is very active in preventing coagulation was proved by further experiments, since he found that simple serum coagulated in about three to five minutes when a small amount of eel serum was added to it. When, however, the liver was isolated and the circulation thoroughly washed with salt solution, and when serum was run through this organ and eel serum was then added, coagulation was prolonged to as great a length of time as four days. This was also, in less degree, found to be the case when the direct effect of both the liver cells and diastase, toxins or peptone solutions, was studied. Delezene concludes that since the passage of defibrinated blood or of blood serum through the liver causes it to lose its coagulating property, and also at times to acquire actual anticoagulant properties, it must be admitted that the liver has an important action in preventing coagulation. As to the exact nature of this action further studies are necessary.

Schurig² had made injections of hæmoglobin in order to determine the fate of this substance in the organism. Injections were made into the subcutaneous tissue. As the result of his investigations the author

¹ Nouveau Montpellier Méd., 1898, Nos. 31, 32, 33, 34.

² Archiv f. Exper. Path. u. Pharmacol., Band xli., Heft 1.

decides that a portion of the hæmoglobin is transformed at the point of injection into other compounds containing iron, and these are subsequently carried to various organs; these compounds are found at the point of injection within three days. Most of the hæmoglobin entered the circulation as such, part of it being converted into bilirubin in the liver, while another portion was converted into iron compounds by the spleen, the bone-marrow, and the cortical cells of the kidney. If larger quantities are injected the hæmoglobin is deposited in the liver and renal cortex. If, however, very large quantities are introduced, all the organs together are insufficient to dispose of the entire amount, and it appears in the bile and in the urine in native form.

Hydræmia. The possibility of the occurrence of true hydræmia has sometimes been questioned. Undoubtedly marked hydræmia is a rare condition, but the occurrence of moderate grades is certainly frequent in anæmias and in various diseases in which there is secondary anæmia.

G. Diebella and L. v. Kety¹ have made some investigations of hydræmia in Bright's disease, especially regarding its relations to albuminuria and dropsy. In the first place, they point out that hydræmia is a condition in which there is an absolute reduction in the percentage of solid matter in the plasma. The mere reduction of solid matter in the blood, due, perhaps, to decreased number of corpuscles, does not constitute hydræmia. Hydræmia may occur either in consequence of a loss of albuminous solid matter or of dilution. Their own investigations were conducted in the following manner: After determining the character of Bright's disease the urine was collected for twenty-four hours, accurate determinations of the specific gravity were made and the percentage of albumin determined by heating and weighing the coagulated albumin. The globulin was precipitated and weighed at the same time. The determination of the degree of hydræmia was derived from a consideration of the principle pointed out by Schnaltz, that the specific gravity of the blood depends, in the first place, upon the amount of hæmoglobin contained in it. It follows, therefore, that the specific gravity varies with variations in the hæmoglobin. One of the authors previously determined, by a series of investigations in persons suffering from secondary anæmia, that there is a regular gradation in the degrees of specific gravity as the amount of hæmoglobin decreases. Beginning with hæmoglobin 20 per cent. and specific gravity of blood 1031.7, there is, for each increase of hæmoglobin of 10 per cent., an increase on the average of 4.46 in the specific gravity. Comparing such a table with the hæmoglobin and specific gravity figures obtained in cases of Bright's disease, they could readily demonstrate whether the specific

¹ Deutsches Archiv f. klin. Med., September, 1898, lxi., Heft 1 and 2.

gravity was greater or less than would correspond with the figures in ordinary anæmia. As a rule, they found it less, showing that at a certain grade of anæmia there was a resulting specific gravity of the blood which could only be explained by assuming that the blood was more watery. Altogether, their examinations included fifty-five cases. In summing these up they omitted the cases that occurred in women, because they had found in previous investigations that the blood of woman is normally slightly hydræmic as compared with that of man, and this seems to hold good still more in Bright's disease; but to avoid any difficulties they omitted the cases in women entirely. Taking, then, the cases in men and comparing the daily excretion of albumin with the hydræmia, determined as above indicated from the specific gravity figures, they found what appeared to them a direct relationship between the grade of hydræmia and the amount of albumin excreted in the twenty-four hours. In studying the relation of hæmoglobin in the blood with the grade of hydræmia, they could not determine any definite relationship. The specific gravity of the blood, however, had an inverse relationship to the grade of hydræmia; the greater the specific gravity, the less the hydræmia. There was also a correspondence in the degree of hydræmia and the degree of dropsy. The authors conclude that the hydræmia of Bright's disease, while it may be in a sense mere dropsy of the blood, is at least the first to show itself, antedating dropsy of the tissues. It is dependent upon, and probably in a large measure, the result of retention of water due to a failure in excretion, and also, no doubt, upon excretion of albuminous matter.

Askanazy¹ discusses the amount of water in the blood and serum in various conditions, describing his method of examination, etc. He finds that the blood of man contains 78.087 per cent. of water, that of women 79.47 per cent. The blood-serum contains respectively 90.44 per cent. and 89.99 per cent. His specific gravity of the blood was 1029.7 and 1030.2 respectively. He found that heart lesions that are compensated do not affect these figures, except that the serum is more dilute. There is not an abnormal collection of water in the blood, and this is true of both the central and peripheral circulation. In nephritis, on the other hand, when dropsy was present, the blood and serum contained an excess of water. But when dropsy was absent the blood was approximately normal. Anæmias of various kinds caused marked increase in the water of the blood-serum; this was also true of leukæmia, though to a less degree.

Lipolytic Function of the Blood. Cohnstein and Michaelis² contribute further studies of the lipolytic function of the blood. In contin-

¹ Deutsche Archiv. f. klin. Med., December 9, 1897.

² Pflüger's Archiv. f. Ges. Physiol., lxi., S. 76.

uance of their former investigations with regard to the disappearance of the fat of the chyle from the blood, the authors have studied the effect of temperature upon this process. At 40° they found the lipolytic action very much more active than at normal temperatures, and on the average of a series of experiments they found the percentage relation of destruction of fat at 40° compared to that at ordinary temperature as 62.3 to 36.2 per cent. The presence of oxygen is necessary to this lipolysis; even in the process of drying a mixture of blood and chyle for the purpose of determining the fat there is some destruction of the fat, so that the quantity is invariably found to be less than that obtained by separate determination. From this they explain the fact that the blood of dogs fed with fat does not contain more fat than starving dogs. In a mixture of serum and chyle there is no destruction of fat, and, in correspondence with this fact, they point out that the serum of starving animals is much poorer in fat than in animals well fed. They state further that an extract of blood made with 0.6 per cent. salt solution, and dried at 100°, had no such power.

Cholesterin in the Blood. E. Hepner¹ has investigated the amount of cholesterin in the blood-corpuscles by a new method. Using acetic ether for the extraction of the cholesterin, he has obtained distinctly higher percentages than have those using other methods, the results being, in his opinion, the more accurate because the acetic ether extracts the cholesterin more completely. His averages were, for a horse, 0.275 per cent. in the red corpuscles; in the dog, 0.522 per cent. The amount of cholesterin contained seemed to be entirely unrelated to the kind of food taken, and did not vary when the animals were freely fed or when they were starved. The method used consisted in weighing the corpuscles after they had been centrifugated and dried; alcohol was then added and they were placed in a hot oven for forty-eight hours; the alcohol was then renewed, the mass being heated until the alcohol simmered and the alcohol then drawn off; alcohol was again added and boiled, and again drawn off, and the remainder washed repeatedly with alcohol; the alcoholic extracts were collected, water added, and the alcohol driven off by heat. The watery fluid was then extracted with several portions of ether; the ether was distilled off, and the remainder weighed, all the substances soluble in alcohol and ether then being retained in the distillate. The cholesterin was extracted by adding acetic ether, heating to the boiling-point, and then cooling; after filtering off the acetic ether the cholesterin crystallized out, and was extracted repeatedly with the acetic ether, the extract being repeatedly washed with the acetic ether until it was entirely colorless; the acetic ether was then distilled off and

¹ Pflüger's Archiv, Band lxxiii., Heft 11 and 12.

the residue dried and weighed. Beside finding the esters of cholesterin in the blood-plasma, some free cholesterin was also present.

Ammonia in the Blood. H. Winterberg¹ has made investigations concerning the amount of ammonia in the blood of individuals in health and in diseased conditions, for the purpose of investigating especially the changes that the ammonia may undergo in acid intoxication, and the question of so-called ammoniæmia, which is described as a special variety of uræmia, due to absorption into the blood of ammonium carbonate. Winterberg describes his own apparatus and his methods for the determination of the amount of ammonia. In twelve cases, probably normal in this regard, the ammonia varied from 0.6 to 1.3 mg. in 100 c.c. of blood, the average amount being 0.9 mg. In fifteen cases with fever great variations were found; in a few instances the amount was excessively high, but there was no relation between the height of the fever and the amount of ammonia. The theory that uræmia is due to the production or absorption into the blood of ammonium carbonate seemed to be overthrown by the fact that in two cases presenting uræmic coma the ammonia was but slightly increased, and in a case of uræmia with acute nephritis, the amount of ammonia was subnormal. Experimental uræmia was not accompanied by any increase in the amount of ammonia. V. Jaksch's ammoniæmia is very similar in clinical appearance to septicæmia and pyæmia, and as several of the latter cases showed no increase in the amount of ammonia, Winterberg gravely doubts the existence of ammoniæmia. One case of diabetic coma showed marked increase in the amount of ammonia.

The question as to the place in which urea is produced was investigated. If diseases of the liver result in decreased production of urea the ammonia would be increased. This was not true, however, in three cases of cirrhosis, and injections of one-twenty-fifth normal sulphuric acid into the common bile duct, with consequent destruction of some of the liver parenchyma and production of icterus, was not attended by any distinct increase in the amount of ammonia; neither was a case of acute yellow atrophy. Even when Winterberg made an Eck's fistula in a dog, and tied the arteries so as to exclude the blood entirely from the liver, and then destroyed the parenchyma by injection of one-twenty-fifth sulphuric acid, there was no decrease of urea nor increase of ammonia until shortly before the death of the animal, when the urea fell to 73 per cent. of the total nitrogen, while the ammonia was found to be 4.91 per cent. He, therefore, decides that the relative amount of urea and ammonia found do not vary unless the liver tissue is to a very great degree destroyed. If there is very little liver tissue left the urea will

¹ Zeitschrift v. klin. Méd., Band xxxv., Heft 5 and 6.

decrease and the ammonia increase, but destruction of the liver tissue sufficiently extensive to cause this scarcely ever occurs.

The Significance of the Alkalinity of the Blood. K. Brandenburg¹ publishes some investigations upon the alkalinity of the blood. The most important point is his insistence upon the value of estimating the amount of total nitrogen in the blood and blood-serum at the same time that the alkalinity of the blood and blood-serum is determined. He learned that the alkalinity increased or decreased as did the total nitrogen. This was true of practically all the cases excepting two of uræmia, in which the alkalinity was very low although the albumin in the blood-serum was about normal. The alkalinity was generally found to be low in young persons and in primary and secondary anæmias, while increased alkalinity was found in catarrhal icterus. In fever the alkalinity was found to vary from the highest normal limits to subnormal, the changes being almost parallel to those in the amount of albumin. The method which Brandenburg used was titration with one-tenth normal tartaric acid, which is usually admitted to be unsatisfactory. He claims, however, that with the coincident determination of the amount of nitrogen useful results are obtained. Normal individuals had an alkalinity of the total blood of from 330 to 370 mg. of NaOH in 100 c.c. of blood; the same quantity of serum required from 160 to 190 mg. of NaOH. The total in nitrogen of the blood varied normally from 3.4 per cent. to 3.70; the quantity in the serum from 1.3 per cent. to 1.6 per cent.

A review of the studies of the alkalinity of the blood has been made by P. Dessèvre,² who finds that it varies in physiological conditions. It is usually low in youth and after prolonged muscular exercise, and increases after eating. In acute diseases the alkalinity is usually normal, or increased in the early stages, while it diminishes during convalescence, and then becomes subnormal in a majority of cases. The intensity of fever has no relation to the degree of lowering of the alkalinity. In chronic diseases the alkalinity is usually diminished if the disease has been present for some time. Attempts to increase artificially the alkalinity of the blood have had no permanent results.

The Proteid Constituents of Hæmoglobin. F. N. Schulz³ has investigated the proteid constituents of hæmoglobin. Hæmoglobin is composed of the coloring matter and also of a proteid body, which has not, up to the present time, been carefully examined. The author speaks of this as globin, and prepares it by taking an aqueous solution of hæmoglobin of horses' blood, treating this with small amounts of dilute hyper-

¹ Zeitschrift für klin. Med., Band xxxvi., Heft 3 and 4.

² Thèse de Lyon, 1897-98.

³ Zeitschr. f. Physiol. Chem., xxix., S. 449.

chloric acid, and then with one-fifth volume of alcohol. The coloring matter is removed with ether, and the watery alcoholic solution separated from this is neutralized with ammonium; the precipitate is filtered and washed, and is then dissolved in water containing a few drops of acetic acid. This acid is afterward removed by dialysis. The globin thus obtained in solution presents certain differences from the reactions of other albuminous bodies. One peculiarity is its precipitation by the careful addition of ammonium and its resolution when the ammonium is in excess. If the solution is previously rendered acid with hydrochloric acid there is still a precipitate on addition of an excess. The globin is rapidly digested by pepsin, and in four hours pure peptone alone is found. Digestion with trypsin forms leucin, but not tyrosin. The globin, as far as its chemical nature is concerned, is to be ranked with histone.

Altered Conditions of the Plasma or Serum. These undoubtedly play a very important part in the pathology of disease and deserve the closest study. Unfortunately, very little accurate knowledge has thus far accumulated, and the investigations hitherto reported are unsatisfactory. In this class may be placed such experiments as those of Battistini and Scofome,¹ who have studied the toxicity of the blood in very anæmic animals. They rendered dogs anæmic by introducing small amounts of pyrocin from time to time. The blood of such animals was obtained, defibrinated, and introduced into the veins of the peritoneal cavity of healthy dogs after a venesection of an equal amount. Two sorts of results were observed. In cases of large transfusions, nervous symptoms, such as general languor, ataxia, paresis of the hind legs, lasting for as long as one week, occurred. The second group of symptoms were observed with small transfusions as well as with large. They consisted of disturbances of nutrition, destruction of the red corpuscles, and loss of weight. These experiments are entirely inconclusive and teach but little regarding toxic or non-toxic conditions of the serum.

LEUCOCYTOSIS.

Leucocytosis is a condition of great scientific and practical interest, and one that has been studied very carefully in recent years, but which is, nevertheless, still shrouded in much uncertainty. Even the definition is difficult to formulate. Some would apply the term to temporary or trivial conditions in which the number of polymorphous leucocytes in the circulating blood is increased; but it cannot be denied that there are forms of leucocytosis that are quite persistent, and some cases in which

¹ Arch. f. Ital. de Biol., 1897, xxvii., 3, p. 401.

the mononuclear leucocytes or the lymphocytes are mainly concerned. It seems quite settled from recent studies that there are two elements in the pathogenesis: there is active production of white corpuscles, and there is disorder in their distribution throughout the circulation. An old theory, that the leucocytes accumulate because of slower destruction, remains unproved.

The Significance of Leucocytosis. Muir¹ opened a discussion upon the significance of leucocytosis before the British Medical Association. He applies the term to any condition in which there is a local or general excess of leucocytes in the body. In nearly all of these cases of general leucocytosis the polymorphonuclear neutrophile leucocytes are in excess. He believes there is an active increase in production and that the lymphatic tissues and the bone-marrow are the chief seats of this increase. The cells produced in the latter situation are larger than those formed in the lymph-glands. Local leucocytosis, such as that produced by injection of staphylococci, is associated with absorption of fat in the bone-marrow, and the large, finely granular cells are increased in number. In other words, there is a local increase of finely granular leucocytes and general increase of the same cells in the blood, and an increase in the marrow-cells from which he believes these are derived. He regards the changes in the marrow, therefore, as the fundamental means whereby leucocytosis is brought about. In concluding the discussion of his paper, he stated that chemotaxis was the only agent which would fully explain many of the phenomena of this process.

Hugo Weiss,² in discussing the origin of leucocytes and the nature of leucocytosis, holds that pathological leucocytosis is due to the presence of some chemotactic substance in the blood, especially products of bacterial activity. The leucopenia of typhoid fever and other conditions, he suggests, may be due to negative chemotactic action. The leucocytosis of infectious diseases is conservative in a double sense. It antidotes the toxic products by bringing cell-constituents into combination with the toxins, and it favors increased phagocytosis. While these last statements express in a brief way the belief of many authorities, it cannot be pretended that such belief is grounded in any well-ascertained facts. There is more of speculation than of demonstrated truth in the whole matter.

The Value of Artificial Leucocytosis. J. M. Krausmann³ records his interesting experiments, upon the value of an artificial leucocytosis, in an experimental infection with cholera vibrio, pneumococcus, and anthrax. He used injections of spermin and protalbumose, the latter

¹ British Medical Journal, September 3, 1898.

² Wien. klin. Wochenschrift, January 20, 1898.

³ Thèse de St. Petersburg, 1898.

in a 4 per cent. solution. Under the influence of spermin there was a marked hyperleucocytosis, which reached its maximum in from three to five hours; the same occurred after protalbumose, but reached its maximum only after eight to ten hours. This hyperleucocytosis had a remarkable influence upon anthrax, cholera, or pneumonia, experimentally produced in rabbits. The most favorable time for infection is that at which the hyperleucocytosis reaches its maximum; the most unfavorable time is that when the number of leucocytes is decreasing. The injections of cultures of the bacteria mentioned caused a diminution in the number of leucocytes. In cases of fatal infection with the cholera vibrio or the pneumococcus, there was a progressive hypoleucocytosis; if the animal was about to recover this hypoleucocytosis gave place to an increase in the number of white corpuscles. On the contrary, infection by the anthrax bacillus caused hyperleucocytosis, whether the case terminated in recovery or death.

Digestive Leucocytosis in Disease. A Hoffmann¹ has studied 24 cases of carcinoma of the stomach (9 of ulcer, 5 of carcinoma of the œsophagus, 12 of anacidity, and 1 of nervous vomiting) to determine the presence or absence of digestive leucocytosis. Among 24 cases of carcinoma there were two with decided and one with moderate leucocytosis, after food consisting of milk and eggs. In the cases of ulcer and the other anatomical diseases of the stomach, digestive leucocytosis was absent in many cases, and in other cases it appeared very distinctly.

These results show that the test is of no value at all in differentiating between ulcer and cancer of the stomach.

Changes in the Blood in Leucocytosis. Löwy and Richter² have investigated the albumins of the blood in cases of leucocytosis, while in the normal blood no modified form of albumin is present. They could demonstrate albumoses in leucocytosis, especially in the declining stage, and regarded this as an evidence of destruction of the leucocytes. They produced the leucocytosis either by administering pilocarpine, spermin, or nuclein. The two latter caused the appearance of albumoses in the blood, even in the primary stages.

They also investigated the glycolytic action of such blood, and discovered that this was less pronounced than in normal blood. This was notable very early after the administration of spermin and nuclein.

Hypoleucocytosis Caused by Injections of Substances Preventing Coagulation. Delezene³ found that hypoleucocytosis occurs after the injection of substances which prevent coagulation. This he has demonstrated by making blood-counts immediately before and shortly after the

¹ Zeitschr. f. klin. Med., xxxiii., S. 460.

² Berl. klin. Wochenschrift, 1897, No. 47.

³ Nouveaux Montpel. Méd., 1898, Nos. 31-34.

injection of Witte's peptone or the serum of eels, soluble ferments such as diastase, bacterial toxins, etc. ; the hypoleucocytosis is usually of a very intense grade. It has been suggested by certain authors that this hypoleucocytosis is due to the passage of the leucocytes from the vessels of the abdomen into the tissues. This, however, seems very improbable because the diminution of leucocytes occurs so rapidly, and an experiment of Delezenne's showed that when the abdominal circulation was cut off the hypoleucocytosis still occurred, so that the outwandering of the leucocytes does not seem to take place from the abdominal circulation at any rate ; and that the leucocytes are not diminished in the blood-stream in the larger vessels, he also proved by counting the corpuscles in blood taken directly from the carotid arteries. Further, he determined the effect of cutting the cervical cord, and thus causing a dilatation of the vessels, or producing the same effect by section of the splanchnics. Either of these procedures gave an immediate decrease in the number of leucocytes in the large vessels, while excitation of the cut ends, which caused the contraction of the small vessels, tended always to cause the leucocytes to approach the normal number in counts made from the large vessels. This leads him to conclude that the hypoleucocytosis, caused by injection into the circulation of various anticoagulant substances, is produced both by destruction of white blood-cells in the circulation, and probably, also, by general dilatation of the small vessels which causes the accumulation in them of a certain number of leucocytes that have escaped destruction.

The Significance of Eosinophilia. Increase in the number of eosinophile cells has been regarded as a fact of value in the diagnosis of various diseases. It was first described by Ehrlich as a sign of leukæmia ; but this was soon found to be erroneous. Subsequently increase of the eosinophiles or eosinophilia was discovered in asthma, certain skin diseases and nervous diseases, and more recently in trichinosis. The underlying significance of the symptom is wholly obscure. Neusser believed the sympathetic nervous system was in some way concerned, but does not appear to have had any definite reasons for his belief.

T. R. Brown² describes an additional case of trichinosis in which the diagnosis was first made because of the marked eosinophilia. The case occurred in a boy, thirteen years of age, whose earlier complaints were pain in the calf muscles and headache. There had never been swelling of the legs, but the eyelids had been somewhat puffy. The boy had an eosinophilia of 48 per cent., and investigations show that a few weeks before he had eaten raw sausage. A piece of the left gastrocnemius was removed, and showed young, non-encapsulated trichinæ in the fibres and

¹ Medical News, January 7, 1899.

about them, and a recent active myositis. There were many eosinophiles present among the cells. The boy recovered entirely after three weeks ; three months after the symptoms had disappeared, however, there was a slight eosinophilia. It is believed probable that the polymorphonuclear neutrophiles are the source of the eosinophiles in these cases, and that the muscles are the seat of the change from one variety of cells to the other.

The same author,¹ in answer to a remark of Cabot's, that it would be interesting to know how long the increase of the eosinophiles in the blood lasts in cases of trichinosis after the acute symptoms have disappeared, states that his third case left the hospital in January, came back in the following July, and on examination was found to have the normal proportion of leucocytes. It would be expected, he notes, that the increase of eosinophiles would not last long after the acute stage has passed away, though a considerable degree of eosinophilia would make it probable that the symptoms would endure for at least some time after its causes had subsided.

Bettmann² has found large numbers of eosinophile cells in blisters produced by cantharides ; in cases in which there was eosinophilia of the blood the eosinophile cells in these blisters were much more numerous than in normal individuals. He explains their presence in the blisters by accepting Ehrlich's theory of a chemotactic stimulus, and discards Schmidt's belief in local formation of eosinophile cells.

Diebella³ found in the examination of four cases of severe anæmia that a certain relationship existed between the number of eosinophile cells and the prognosis. He was able to determine that as long as the typical picture of progressive pernicious anæmia remained present, the number of eosinophile cells remained within normal limits, but with the incidence of improvement the eosinophile cells increased threefold, and remained increased as long as there was this tendency to improvement. As Ehrlich has taught that these cells are derived from the bone-marrow, their increase in these cases would probably indicate that they are an evidence of regenerative processes.

SECONDARY ANÆMIA.

It must be admitted that there is cause for doubting the accuracy of our present classification of anæmic diseases, and the attempts made from time to time to establish new clinical forms have some justification. Some authors still describe a form of "simple primary anæmia," and

¹ Boston Medical and Surgical Journal, September 1, 1898.

² Münch. Med. Wochenschrift, September 27, 1898.

³ Ungar. med. Presse, 1897, ii., 28 and 29.

various types of splenic anæmia have been proposed as distinct varieties. It is true that cases are occasionally encountered in which the clinical symptoms and the state of the blood do not seem to warrant a diagnosis of any of the recognized forms of primary anæmia, and in which there is no discoverable underlying disease as a consequence of which the anæmia could be supposed to have developed. Notwithstanding these facts, however, the attempts to establish new forms of anæmia are unconvincing, and that of Dansac¹ is not less so than others that have preceded. He concluded, from numerous clinical observations and repeated examinations of the blood and of tissues obtained at post-mortems, that there is a special affection of the blood which is due to a disturbance of hæmatopoiesis, and is characterized by the persistence or reappearance of the embryonal forms of hæmatopoiesis—that is, by the appearance of the foetal form of red cells and of nucleated cells; he would term this affection erythrocytosis. He distinguishes this from the symptomatic affections in which nucleated red corpuscles are found in large numbers in the blood, by the following symptoms which he considers essential to the diagnosis: First, there is hypertrophy of one or more lymphatic organs, usually of the buccal, naso-pharyngeal, and lingual tonsils, of the glands of the mediastinum and mesentery, and also of the spleen; second, nucleated red corpuscles are found in the vessels of the hypertrophic lymphatic organs and in the blood-current; third, there is an entire absence of increase of the leucocytes; the presence of nucleated red corpuscles may be localized entirely to the lymphoid tissues, and not observed in the general circulation. The affection follows a regularly progressive course, appearing in childhood or about puberty; at the latter time, if it has existed previously, the symptoms may become aggravated or they may disappear. There are frequently attacks of fever in connection with it, which may be acute or slight and somewhat protracted; oftentimes, however, the whole course is apyretic. The author believes that this disease should be thought of in all cases presenting profound anæmia with marked loss of nutrition and with swelling of the lymphatic glands. Dansac believes that the disease is produced by a lack of the proper albuminous substances in the blood and low alkalinity, and that the source of the disease is probably gastro-intestinal. The treatment should include the use of alkalies, iron, and tonics, and whenever possible the removal of the enlarged tonsils and adenoids. Such cases must, in the light of our present knowledge, be regarded simply as secondary anæmia.

H. M. King² discusses the condition of the blood in septic diseases of the abdomen and pelvis. In the mild forms, the so-called sapræmias,

¹ Thèse de Paris, 1897-98.

² Medical Record, October 8, 1898.

nothing abnormal is found excepting slight leucocytosis; in more severe degrees of sepsis, however, when there is marked intoxication of the system with bacterial products, but without actual pyæmia, the condition of affairs varies, chiefly in relation to the duration of the disease. If death occurs early no change may be found, while in more protracted cases a severe anæmia develops, and leucocytosis is seen. If the number of leucocytes becomes constantly decreased without any definite cause, the occurrence is of evil prognosis, indicating that the system has become generally infected. If, on the other hand, the number of leucocytes increases, it indicates that the suppuration has extended locally, but has not produced a general infection. There was no evidence in King's studies that there was any characteristic blood condition associated with sepsis of the pelvic or abdominal organs; other septic conditions produce changes in the blood which are exactly similar.

Page¹ calls attention to a form of secondary anæmia which he believes is due to increased functional activity of the spleen, resulting from vasomotor disturbance caused by the collapse of the stomach and intestines. Cases of this sort are most frequent in women, and are best treated by suitable clothing, arsenic, and iodides.

The Treatment of Anæmic Conditions. This is still a subject of interest and one requiring study. The usefulness of iron is one of the most certain facts in therapeutics, but opinions differ widely as to the best form and mode of administration and as to the way in which the drug acts. It is certain that iron does not act merely by reason of its entering the blood and becoming available as hæmoglobin. The amount of iron in the blood at any time is far less than that ingested in many cases. It seems certain that there is some distinct action exercised by the drug upon the tissues of the body, and it is likely that it operates as a direct stimulant to hæmatopoiesis. This explains the necessity of administering very large doses, quantities often in excess of the total iron of the body. It remains to be learned in what form absorption is most active and the therapeutic effect most marked.

THE ABSORPTION OF IRON. A Haffmann² has made further researches upon the question of the absorption of iron when given in the organic and inorganic forms. He took pieces of the stomach, of various portions of the intestine, and of the liver, the kidneys and the spleen, and placed them, after washing with physiological salt solution, in 70 per cent. alcohol to which was added some sulphide of ammonia (as recommended by Hall). On the next day they were placed in absolute alcohol, subsequently embedded in paraffin; after cutting, the paraffin was removed from the sections, and the latter were placed in ammonium sul-

¹ Medical News, February 5, 1898.

² Virchow's Archiv, Band cli., Heft 3.

phide and allowed to remain in this for about three-quarters of an hour, and then passed through a mixture of water and glycerin. This method was compared with the potassium ferrocyanide and hydrochloric-acid method, and the latter was found to be much less satisfactory. The fresh stomachs from a number of human beings were examined, and it was found that iron was present in the wall of the duodenum in these cases, even when none had been administered as a drug; this, of course, came from the food. Stomachs from certain other patients whose deaths occurred some days after iron had been administered were examined, and it was found that iron was not present in much larger quantities than in the first series. Guinea-pigs were examined after receiving no iron except that in the food and after being given doses of preparations of inorganic iron. It was found that iron was present in much larger quantity in the walls of the duodenum and jejunum when inorganic preparations had been administered; it was probable, therefore, that the iron absorbed in the human beings was taken into the circulation and carried away much more rapidly than in the case of the guinea-pigs. The guinea-pigs were first given green vegetables which contain a considerable quantity of iron; afterward inorganic preparations were administered with the same kind of food. In both instances a marked iron reaction was obtained in the duodenum, and to some extent in the jejunum; much more striking evidences of the absorption of inorganic preparations were furnished, however, by other experiments, which consisted in feeding the animals upon oats, which contain little organic iron compounds, and then giving the doses of inorganic iron. In the latter case the reaction for iron was very marked, while when the oats alone were given the reaction was extremely slight. The iron was excreted chiefly through the kidneys and the colon; the reaction for iron in the latter portion of the bowel was present as the result of excretion, and not of renewed absorption, for several reasons. In the first place, in the colon the iron lay in masses in the submucous tissues, while in the duodenum it was found in smaller flakes directly beneath and within the epithelium; further, when iron was given for a brief period and the animals killed as long as six days afterward, though all the iron had disappeared from the duodenum, there was still a marked reaction in the colon; and, finally, the iron reaction was present in striking amounts in the colon after subcutaneous administration of iron preparations.

V. Starck¹ has investigated the absorption of hæmatogen, hæmoglobin, and the syrup of oxide of iron in animals, and found that the last, which is an inorganic preparation, was best absorbed; he prefers the administration of inorganic preparations rather than those produced from organic

¹ Deutsche med. Wochenschrift, December 22, 1898.

compounds, since it has been very distinctly proved that the inorganic iron is well absorbed, and, furthermore, seems to do most good. It is certainly true that the inorganic preparations are active in practice.

Bunge¹ refers to experiments made at his suggestion by Hausermann, in which it was shown that 100 gm. of dry residue of rice contained from 1 to 2 mg. of iron. Barley contained only 1.4 to 1.5 mg.; white flour, 1.6 mg.; whole barley, 4.5 mg.; rye, 4.9 mg.; wheat, 5.5 mg.; and bran, 8.8 mg. It follows that the iron is principally contained in the shells or outer coverings of the grains. He then suggests the very important problem as to whether or not the digestive processes of man and animals are able to extract the iron from the bran. To determine this matter, eight young rats were fed, four with white bread and butter, and the other four with bread made of wheat bran with butter. The ones fed upon the white bread did not grow as rapidly as the others. The total gain in weight of all the animals, which were killed in pairs at different times, was 19.25 mg. (animals fed on bread) against 83.05 mg. (animals fed on brown bran). The hæmoglobin percentage for each thousand parts of the body-weight was 6.13 for the rats fed upon the bread, and 7.14 for those fed upon brown bread. It is evident, therefore, that the animals were able to absorb the iron from the bran, and to assimilate it with formation of hæmoglobin. The question, however, suggests itself as to whether the increased rapidity of growth of the animals fed upon the bran bread was due to the greater richness in iron, or to the fact that the animals fed upon the plain bread were not sufficiently supplied with calcium. On analysis it was found that the calcium of the bread was two-thirds that of the bran bread, but the iron was only one-fourth as much. The author concludes his paper with a description of his methods of estimating the total hæmoglobin by a colorimetric process.

J. Gaule² has discussed the absorption of iron and the synthesis of hæmoglobin, pointing out that chloride of iron is absorbed from the gastro-intestinal tract, especially from the duodenum, and can be demonstrated in the lymph. Further, he found that within twenty-four hours after the introduction of chloride of iron the hæmoglobin increases, and in seventy-two hours the number of red corpuscles may increase. He then attempts to solve the problem of the location of conversion of the inorganic hæmoglobin compound by precipitation with ammonium sulphide. He showed that iron is retained in the spleen, and is of the opinion that the splenic pulp is actively concerned in the synthesis of the hæmoglobin. The process, however, does not go completely on to the formation of hæmoglobin or blood-corpuscles, as we do not find more blood-corpuscles around the iron

¹ Zeitschr. f. Physiol. Chem., xxv., S. 36.

² Zeitschr. f. Biol., xxv., S. 377.

containing pulp cells than elsewhere in the organs. The hæmoglobin formation is completed in the liver and in the bone-marrow. When the spleen and thymus glands were extirpated the liver showed no contrast with the normal strong reaction for iron on addition of ammonium sulphide.

T. Panzer¹ has used iron somatose in a variety of cases, including one of purpura, eight of chlorosis, one of anæmia following ulcer of the stomach, and one an unknown form of anæmia. The treatment ranged from eight to fourteen days, and he used as much as six teaspoonfuls a day in some cases. The results were excellent in one of the cases of secondary anæmia, and in three of the cases of chlorosis. In one of the cases of chlorosis and in the purpura case the result was negative. The preparation was usually well borne, but in one instance vomiting followed its administration.

INJECTIONS OF HÆMOGLOBIN. Stark² found that large injections of hæmoglobin in animals of the same species caused no serious results. He has used injections in human beings of as much as 10 c.c. of a 10 per cent. solution of hæmoglobin obtained from horses. These caused no ill effect excepting slight pain. Injections of blood or preparations of blood into the veins, peritoneal cavity and rectum, have thus far proved of little value.

RESPIRATORY GYMNASTICS. W. F. Somerville³ believes that practitioners commonly overlook the value of proper respiratory gymnastics in treating anæmias. He insists that many of the symptoms, such as dyspnœa, palpitation, and muscular weakness are due largely to imperfect aëration of the blood, and that much of this may be overcome by proper respiration. He thinks that respiratory education should always be part of the treatment of anæmia.

CHLOROSIS.

The nature and even the definition of this disease are still obscure. Authors for the most part tend to take a narrow view, and in seeking for the cause are too much influenced by the mere prominence of certain conditions without seeking to distinguish between cause and effect. For example, Page⁴ would restrict the term chlorosis to the anæmic condition occurring in girls before the establishment of menstruation, and declares that the disease subsides as soon as this function has been properly established.

¹ Wiener klin. Wochenschrift, June 23, 1898.

² Münch. med. Wochenschrift, January 18 and 25, 1898.

³ British Medical Journal, October 1, 1898.

⁴ Medical News, February 5, 1898.

It cannot be denied that menstrual disorders are capable of exerting a distinct influence on the blood, but it is far from certain that the fundamental cause of chlorosis is a derangement of this function. One of the earliest theories regarding this disease ascribed it to the retention of toxic substances consequent upon an inadequate menstrual flow. Recently attempts have been revived to explain the connection between the menstrual disturbance and the anemia.

Some, and among them Etienne and Demang,¹ regard as the cause of chlorosis an intoxication resulting from decreased ovarian secretion; others believe that there is a retardation of hæmopoiesis as a result of lack of the normal stimulus that comes from the proper internal secretion of the ovaries. I can only say of these views that they have not been proved, not even by the therapeutical test of administration of the appropriate organic extract. Whether or not we accept these views depends upon our individual desire to magnify the importance of "internal secretions" or to deny such importance until scientific proof is presented.

N. de Dominicis² takes a different view, and points out that the development of chlorosis is invariably preceded by irregularities in digestion, as is also true of the relapses. The condition of the blood is in accordance with these digestive disturbances, and the general condition of the patient is also in proportion. As far as the menstrual irregularities are concerned, the author points out that these develop gradually, but not until after the beginning of the anæmia, or at the most coincident with the latter, and, therefore, after digestive disturbances have been present. Alterations in the vascular system were found by him only in isolated instances. He concludes that chlorosis is a constitutional disease, a form of diabetes ("blood diabetes") in which an alteration of the red corpuscles occurs before any hyperglycæmia, etc. Beside the ordinary causes of disturbance, the author assumes an individual predisposition.

The Condition of the Blood in Chlorosis. This is well known, and but few facts have recently been added. The moderate reduction in the number of red blood-corpuscles, the disproportionate reduction of hæmoglobin and the reduction in the number of leucocytes, are striking features, but it must be remembered that similar conditions of the blood occur in secondary anemias.

M. Litten³ refers to the cylinders composed of blood-plaques found in the blood in chlorosis. The author has previously pointed out the existence of such cylinders, and Battersack attempted to show that the symptoms of the disease might be caused by the slowing of the capillary circulation caused by them. Litten himself, however, points out that

¹ *Quoted in Congress France de M. d. Intern.*, 1898.

² *Wien. med. Wochenschr.*, 1897, No. 39.

³ *Wien. med. Wochenschr.*, 1898, No. 12.

the place of formation of these cylinders is not in the capillaries, as is evident by the transverse section of the cylinder which often exceeds the diameter of the capillaries. In fact, the author holds that these formations do not exist as such *intravital*, but that they are formed after the blood is drawn, even though the conglutination has been possible and has, to some extent, taken place in the circulatory blood.

Thrombosis in Chlorosis. This tendency to conglutination of the blood-plaques may be of some importance in connection with venous thrombosis, a condition of clinical and pathological interest in this disease.

H. Schweitzer¹ presents an extremely interesting paper on thrombosis occurring in chlorosis. He reports four cases from Eichhort's clinic. In one of them the thrombosis affected the veins of both legs; in one the right leg only was affected, and in the other two it was in the left leg. He has made a careful study of the literature, and gives abstracts of all previously reported cases, which number forty-seven. Upon the basis of these he makes a study of the condition. The etiology is probably to be sought in alterations in the endothelium, which, together with the blood changes, leads readily to thrombosis. There is no absolute proof of these endothelial changes as yet. The cases naturally occurred almost entirely in women and girls, all but three of them being in patients between sixteen and twenty-eight years of age, and most of them in those who had been obliged to do hard labor. The thrombosis occurred in cases of all grades of severity. It was of three main varieties: thrombosis of the cerebral sinuses, of the lower extremities, and of the upper extremities. There was one instance of an apparently primary thrombosis of the pulmonary artery. Symptoms of thrombosis of the cerebral sinuses usually began with violent headache, most commonly in the occipital region; this was followed by marked nervous symptoms, usually delirium, then various forms of paralysis and not infrequently convulsions. The condition of sensation varied from an almost complete loss to a marked hyperæsthesia; the pupils were variable, as were also the reflexes. Cheyne-Stokes respiration was frequently present. The affection usually ended with coma, and death commonly ensued within five days. There is one case reported in which thrombosis of the cerebral veins was probably present, and in which the veins of the arm and neck subsequently showed thrombosis, yet recovery ensued; all others ended fatally. Thrombosis is usually accompanied by marked changes in the brain; the brain-substance almost always shows some hemorrhagic encephalitis, and frequently there are apoplexies. Thrombosis of the cerebral sinuses occurred in 24 per cent. of

¹ Virchow's Archiv, Band clii., Heft 2.

all cases ; thrombosis of the extremities occurred in 74 per cent. of all cases, and was most frequently situated in the left leg. The symptoms were those commonly seen in this variety of thrombosis, and distress continued to increase for ten days or two weeks usually, and then decreased ; health was regained after four to six weeks. It is worthy of special note, however, that seven of these cases had embolism as a result of the thrombosis, and in all of these cases the embolism followed the assumption of the erect posture too soon after the onset of the trouble, namely, within two to four weeks. In one of these cases there was evidence of embolism of the pulmonary artery, but the patient, nevertheless, recovered. The remaining six instances of embolism were all fatal. One especially interesting case of thrombosis is abstracted from Hèul's report. In this instance the thrombosis wandered from vein to vein, and finally affected all the veins of the trunk with the exception of the *anonyma dextra* and its branches ; the vena cava was apparently entirely closed, and the blood was finally carried upward through the two *azygos* veins alone. Nevertheless the patient gradually recovered.

Recently attention has been called to arterial thrombosis, and the following case of S. McKinsey¹ is one of interest. He records a case of chlorosis in a girl of twenty years, in which there was sudden coma with paralysis of both legs, athetoid movement of the arms, and conjugate deviation of the eyes. Post-mortem softening was found in both hemispheres, involving the internal capsule. The probable explanation was thrombosis of the lenticulo-striate, or of some other small vessels. The nature of this case must, of course, remain obscure, but it is at least suggestive.

Gastro-intestinal Symptoms. These are so frequent and striking in chlorosis and other forms of anæmia, that investigations into the nature of the disturbance are always of interest, though nothing of significance has been thus far discovered. Studies of the gastric secretions have not shown any uniform character, and not infrequently the conditions have been found normal. In this connection the experiments of S. M. Hamill² are of interest. In studying the salivary secretion in twelve cases of anæmia, Hamill found that the anæmia of itself does not cause any notable change. In one case of leukæmia the quantity of saliva and its action were normal. In six of chlorosis, four were normal, one was slightly deficient in diastatic action, and one seemed deficient in quantity and power. One case of pernicious anæmia was normal, and in a second case there was diminution in quantity but normal action.

Du Mesnel de Rochemont³ has inquired into the relationship between

¹ Practitioner, February, 1898.

² Philadelphia Medical Journal, January 22, 1898.

³ Münch. med. Wochenschrift, 1897, No. 59.

anæmic conditions and acidity of the gastric juice, as well as gastric ulcer. It is known that in all anæmic conditions, particularly chlorosis, there is a predisposition to the formation of round ulcer of the stomach. According to the author's investigations, it seems very probable that this tendency is partly the result of diminished alkalinity of the blood, but in part due also to hyperacidity of the gastric juice. Both of these facts have long been recognized, and have been assumed to be of importance in the etiology of gastric ulcer. Still, a third predisposing element is necessary, and though this is not certainly known, the author thinks that nervous influences play a part; he points to the remarkable resemblance of round ulcer to the condition known as *mal perforant*. He suggests that a spasm of the bloodvessels may be the cause of the ulcer by rendering a certain part of the gastric mucosa anæmic. Incidentally it is of interest that angioneurotic manifestations are not infrequent in the skin of chlorotics. Various theories of this sort have been propounded by previous writers, and the view has been expressed that spasm of the vessels at the seat of subsequent ulceration is the cause of lowered vitality and thus of ulceration.

Treatment. Brosin¹ reports upon the treatment of cases of chlorosis with hot baths. The author treated some fifty cases, using baths of 32° R., with cool applications about the head during the fifteen to thirty minutes which were spent in the bath. After the bath a rapid cool douche was administered, and thorough friction was then employed, the patient finally resting one hour in the recumbent posture. Three baths a week during four to six weeks constituted the treatment. The results were excellent, the patients feeling extraordinarily well after the baths. Many of the symptoms of the disease were quickly controlled by this treatment, and the general effect upon the disease was satisfactory.

In regard to treatment, de Dominicis² decries the venesections that have been recommended in recent years, which he believes act only in occasional instances by suggestion. He himself recommends transfusions of blood.

PERNICIOUS ANÆMIA.

Authorities are still at variance regarding the nature and even the definition of this condition. Some hold that it is a distinct and definite disease, while others regard it as a condition that may be symptomatic of a variety of diseases. These differences of opinion cannot be settled until more accurate knowledge regarding blood-formation is at hand. Much speculation has been indulged in, and theories are numerous. It

¹ Verhandl. des XVI. Congr. f. Innere med. Weisbaden, 1898.

² Wien. med. Wochenschrift, 1897, No. 39.

may be recalled that the French hæmatologists have long taught that this disease is one affecting hæmopoiesis primarily; in fact, this view was quite generally held at one time. F. P. Henry pointed out that certain of the conditions observed suggest a reversion of the corpuscles to a reptilian type. A somewhat similar view is expressed by C. S. Engel,¹ who believes that in progressive pernicious anæmia there is a reversion to the embryonal form of blood development. He records five cases which presented the clinical symptoms of progressive pernicious anæmia, and then refers to his theory of the origin of the embryonal blood-corpuscles in two generations of what he calls metrocytes, which are followed by the development of normoblasts. In each of these cases of pernicious anæmia which he records he discovered the early forms of metrocytes. These take the orange G. stain in the triacid mixture, and have a large amount of protoplasm and a small nucleus. In one case, although these forms were present and there was a clinical picture of pernicious anæmia, the autopsy showed a carcinoma of the stomach. He explains this occurrence, however, by saying that the causes of progressive pernicious anæmia may be various, and are certainly largely unknown, but that this was a case of true progressive pernicious anæmia. The fact that the medulla of bone is red in pernicious anæmia is, in his mind, a further evidence that the disease is a reversion to the embryonal form of blood development, since the bone-marrow is red in the new-born; and a further evidence is the presence in the spleen and in the blood of the liver of nucleated red corpuscles. There is, in this contribution, as well as in similar statements in other branches of pathology to the effect that a given process represents a reversion to a foetal condition, a laxity of expression that may lead to misapprehension. It is certainly true that the red condition of the bone-marrow is foetal in type, and that to this extent it indicates a reversion; but it should be understood that the red marrow is actively hæmopoietic marrow, and that the need of active blood-formation in foetal life and in pernicious anæmia causes a similarity in the appearances of the marrow. So, too, the occurrence of nucleated red corpuscles in the blood is in a like sense an evidence of a reversion to a foetal type, and other points may be admitted to have the same suggestiveness; but, after all, nothing is gained by such reflections and we have merely stated in new terms what has been known before, viz., that in the effort to supply new blood-corpuscles nature goes through somewhat the same steps in pernicious anæmia as in the embryo. There is not, however, a tendency to reversion to an embryonal condition except to fulfil this one special need, and there is not a primary reversion, but only a secondary process.

The case referred to by the author just cited, of carcinoma of the

¹ Virchow's Archiv, Band cliii., Heft 3.

stomach with the clinical symptoms of pernicious anæmia, resembles one I observed and referred to in discussing this disease.¹ Such cases illustrate the difficulty of diagnosis if we attempt to define pernicious anæmia as an independent disease rather than as a condition met with in various diseases. In this connection a paper of E. Gawitz² is interesting. The author points out that the characteristics of the blood are not distinctive of this disease. He refers to the various changes in the red corpuscles, the presence of nucleated corpuscles, and the character of the leucocytes. With regard to the nucleated red corpuscles, he alludes to Ehrlich's teaching, that the presence of megaloblasts is significant of a bad prognosis. He himself, while not denying this in general, refers to two cases in which megaloblasts were never present, but in which there was a constant deterioration ending in death. In his examinations of blood in pernicious anæmia and other diseases, he notes that the serum in pernicious anæmia is comparatively normal in its composition. In contradistinction to this the serum in certain other intense anæmias, such as those attending tuberculosis, malaria, various infections, carcinoma, chronic hepatic disease, etc., contains a reduced quantity of solid residue. (These results are certainly surprising. No observer, as far as my knowledge is concerned, has found marked reduction of the albuminous constituents of the pure plasma.) He regards this as a point of very great importance in distinguishing pernicious anæmia from other intense anæmias in which the morphological characters of the blood are practically the same. Further, he points out that the clinical course of pernicious anæmia is different from that of other grave anæmias; the new formation or hæmatopoiesis in pernicious anæmia being constantly faulty.

As to the etiology, Gawitz holds that there is not a single cause, and he classifies among the factors: 1. Gastro-intestinal disease of long standing. 2. Pregnancy. 3. Chronic hemorrhages, especially those small in size. 4. Constitutional syphilis, especially when associated with changes in the bone-marrow. 5. Bad hygiene of any sort. 6. Chronic poisoning, as, for example, by carbon monoxide. 7. Parasitism. He instances a case falling under the heading of constitutional syphilis with sclerotic processes in the marrow: A woman of forty-two years, who was admitted on account of severe bronchitis and partial paralysis of the right oculo-motor nerve, and who had also swelling of the glands and spots of leucoderma, showed irregular and marked swellings, which were painless, of the tibia and femur. The Röntgen examinations showed a thickening of the periosteum and of the bone. The blood in this case, in spite of the subsidence of the bronchitis and an increase in weight of ten pounds, was constantly that of a cachectic condition, containing

¹ Twentieth Century Practice of Medicine, vol. vii. p. 379.

² Berl. klin. Wochenschrift, August 8 and 15, 1898.

about 17.84 per cent. of dry residue, and 10.23 per cent. of dry residue in the serum; 3,000,600 red corpuscles with marked poikilocytosis, a few macrocytes, and a very few normoblasts. Among the leucocytes, he noted a striking percentage of eosinophile cells and of large cells with pale, somewhat irregular nuclei. The persistence of the anæmia was striking, and he suggests that this case was one of pernicious anæmia in its earlier stages. (This diagnosis is certainly one in which few will coincide.)

Some authors seek to settle the matter of classification by admitting true "Addisonian pernicious anæmia," a form without ascertainable cause, and a form that is recognized to be secondary. Thus Hayem¹ discusses the matter in recording a case of marked symptomatic anæmia in a woman of thirty-two years, following pregnancy, after repeated hemorrhages had taken place. There was marked jaundice and pigmentation of the skin, suggesting Addison's disease. Both liver and spleen were enlarged, and the red corpuscles were reduced to 651,200, the leucocytes being unaltered in number. There were symptoms pointing to chronic atrophic gastritis. In discussing this case Hayem classifies two forms of pernicious anæmia: the protopathic and deuteropathic or secondary, and he places the case here reported in the second category. Cultures made from material obtained from punctures of the spleen contained diplococci, resembling those of Fränkel, which were toxic for mice. He believes that there was an infection at the time of childbirth.

The relation of parasitism to profound anæmia and pernicious anæmia is one of great interest. Certain authors seek to draw a distinction between the anæmia caused in this way and other forms. These attempts seem to us ill-founded and wanting in support. The manner in which the parasites, especially anchylostomum and bothriocephalus, act, wants further investigation.

W. Zinn and M. Jacoby² recall their previous statement that in case the anchylostomum has once found lodgement among a people it is apt to spread to those who come in contact with any who are already affected. They have stated also that an individual does not necessarily suffer from the symptoms of anchylostomiasis when anchylostoma or their eggs are found in the stools. They consider these statements finally proved by the results of their examination of individuals who are living in Berlin, but who were born in Ceylon or Madras. In the stools of eight persons from Ceylon they found the eggs of the anchylostomum in every case, the eggs of the Trichocephalus dispar in seven cases, and in six instances the eggs of the ascaris. The stools of the individuals from Madras contained the eggs of both the anchylostomum and the trichocephalus in

¹ Gaz. Hebdom. de Méd. et de Chir., May 22, 1898.

² Berl. klin. Wochenschrift, October 24, 1898.

every case, and in five instances the ascaris was found. From these results, they think it is established that the anchylostomum and the trichocephalus may be found in practically all individuals who come in contact with those who are affected, and almost as much may truthfully be said of the ascaris. Not one of these individuals suffered from any symptoms common in those who are the hosts of these parasites. They agree with Leichtenstern, that the affection caused by the anchylostomum is the result both of the loss of blood and of a poisoning which the parasite itself causes.

F. L. Hills¹ records a case of unusual interest, under the title of "Pernicious Anæmia, Complicated by Tuberculous Infection of the Lower Lobes of the Lungs, the Liver, and Spleen." The patient, a widow of sixty-one years, was admitted to the New Hampshire Asylum for the Insane. The history of the nervous condition is of no special interest to us. On May 1, 1897, she was brought back, after a leave of absence, very weak, without much emaciation and without œdema, but very anæmic. The tongue was coated and flabby, the stomach was unretentive of food. Palpation of the epigastrium revealed hyperæsthesia. In the right axilla there were four large lymph-nodes, and two other smaller ones in the left axilla. Examination of the urine was negative, but there was a slight febrile movement. Her mind was quite clear. A blood-examination showed 5,001,600 red corpuscles, 13,000 white corpuscles, and 28 per cent. hæmoglobin. Subsequently, the blood-count fell progressively, and on June 16th the record was 155,760 red blood-corpuscles. The differential count was: lymphocytes, 12 per cent.; polymorphous forms, 61 per cent.; mononuclear forms, 26 per cent.; eosinophiles, 1 per cent. Four nucleated red corpuscles were discovered in examining five cover-glasses. The next day the patient died, though she had talked pleasantly with her daughter but a short time before. At the autopsy the lymphatic nodes referred to were found to be hard and somewhat cheesy, and there were small yellowish nodules in the liver and spleen. From a microscopical report rendered by a pathologist, the author concludes that the lymphatic disease and that of the spleen and liver were tuberculous. It is very unfortunate, however, that more elaborate examinations were not undertaken. The histological details regarding the specimens are rather meagre. The reduction of the number of red corpuscles is most remarkable, and almost equals Quincke's celebrated case in which the number in a case of pernicious anæmia was 143,000 just before death. It seems inexplicable to us that Hill's patient was mentally so clear and alert when the reduction of corpuscles was so inordinate.

The occurrence of lesions of the central nervous system in pernicious

anæmia, leukæmia and other blood diseases, is of great interest, and a careful study of the nervous system should be undertaken in every case. In several cases I have found definite, though mild, symptoms, but I must direct attention to another fact, viz., that in some of these cases I have seen unmistakable arsenical neuritis; twice in pernicious anæmia and once in leukæmia. None of these three cases came to autopsy, and the condition of the spinal cord was not, therefore, determined. There is reason to believe that arsenic is capable of producing changes in the central nervous system, and it is possible that some of the lesions ascribed to the disease were the results of medication.

Patren,¹ in examining the spinal cords of nine cases of pernicious anæmia, in two of which there had been symptoms during life, found hyaline degeneration of the vessels of the white matter in four cases, and small hemorrhages in five, while in two cases there were chronic degenerations. In two cases of Hodgkin's disease which he examined, no changes were discovered. Of the two instances in which symptoms occurred during life, the first showed principally motor symptoms with sensory weakness, ataxia, loss of knee-jerks, and later incontinence of the urine. The columns of Gall and Burdach were almost completely degenerated in this instance. In the second case there was increasing paralysis of the legs with some spastic condition. The same columns were found degenerated, but in addition the right crossed pyramidal tract was involved.

Treatment. With regard to the treatment of the disease, Grawitz² insists upon general measures, such as regulation of the diet, etc., his recommendations in general being practically the same as those made by me some years since. The increase of indican in the urine indicating a process of intestinal putrefaction, leads him to employ calomel, salol, and similar remedies. He advises the use of stomachics to increase the appetite, and suggests exercise, etc., to increase the general tone of the system. With regard to the use of iron, he agrees with others, that this remedy in the earlier stages of the disease is practically contraindicated. Arsenic is the remedy above all others that deserves confidence. With regard to bone-marrow, he refers to one patient in whom he used this remedy without any notable effect. Transfusion has been of use in his experience in cases of pernicious anæmia of pregnancy.

LEUKÆMIA.

Etiology. The etiology of leukæmia is still obscure. Occasionally the clinical course and lesions suggest infection so strongly that we are forced to the opinion that there is an infectious element in these cases. The

¹ Nord. med. Arkiv., 1898.

² Loc. cit.

same must be said, however, of carcinoma and sarcoma, and in its morbid anatomy leukæmia is related to sarcoma in a very suggestive manner. The disease may occur in childhood, as the following references show, although this does not exclude a relationship with sarcoma.

Roleston and Lathan¹ report a case of lymphadenoma involving the stomach, complicated by rickets, which closely simulated leukæmia. The patient, a boy of one and a half years, presented a mass of enlarged glands behind the right parotid; the spleen was very much enlarged, and the disease was quite general throughout the body. Of particular interest was the involvement of the stomach in which polypoid projections were found on the mucous membrane, involving a large part of the organ but leaving the pylorus unaffected. At the end of the illness there was a general petechial eruption. The blood was examined carefully and showed the occurrence of a severe anæmia together with a marked increase in the number of lymphocytes and numerous myelocytes. The authors regard these characteristics of the blood as terminal in their origin.

Cassel² has examined the records of the City Hospital at Friedrichshain, and discovered among 3000 autopsies four cases of leukæmia in children below the age of seventeen years. He himself records a case in a child of eight years who came under observation with a greatly enlarged spleen. There was tenderness over the sternum; the liver was palpable, though not enlarged; the external glands were normal. The urine contained abundance of uric acid. The blood showed 3,500,000 red corpuscles, 500,000 white corpuscles, and 40 per cent. of hæmoglobin. The differential count of the leucocytes showed 69 per cent. of myelocytes, 29.7 per cent. of polymorphous and transitional forms, and 12 per cent. eosinophiles. The red corpuscles showed marked poikilocytosis, and there were many nucleated red cells. The child's health had been good until a few weeks before admission, with the exception of an attack of measles which she had at the age of three years. The patient was dismissed from the hospital without notable improvement after some months, during which the treatment consisted in the administration of arsenic and wine.

Attempts to find micro-organisms in the blood and the organs have frequently been made, sometimes with negative and sometimes with positive results. It does not follow, however, that the organisms in the latter case were the cause of the disease, for terminal infection is frequent in all chronic diseases, and cultures made from the blood and organs after death from chronic disease usually prove positive. Some, however, have found organisms in the blood during life. None of these, however, has been demonstrated as the actual cause.

¹ *Lancet*, May 14, 1898.

² *Berl. klin. Wochenschrift*, January 24, 1898.

Sporozoa in Leukæmia. M. Löwit¹ adds to his previous publication² upon the subject of the sporozoa in leukæmia, an investigation of sixteen cases, in thirteen of which the blood alone was studied in dried preparations. Eleven of the cases were mixed leukæmia, and three pure lymphæmia. In two cases only the organs were examined, and the form of leukæmia is, therefore, uncertain. The sporozoa he refers to were found regularly in the blood within or about the leucocytes, and he claims to have observed processes suggesting multiplication or reproduction of the parasites within the leucocytes. The blood of the spleen was richer than that of the finger end, and it seems probable to him that the blood-making organs are the places of growth and multiplication of the organisms. In the three cases examined post-mortem to determine this point, he found in the spleen, the lymphatic glands, and in the bone-marrow, varying quantities of sporozoa lying in the connective tissues between the leucocytes. There were also, particularly in the bone-marrow, intraleucocytic forms. Large free bodies of amœbaform appearance were found in small numbers. In pure lymphæmia he could not find the sporozoa in the blood, but he did discover them between the leucocytic elements in the organs. The intracellular bodies were not found in these cases.

Though the organism is thus somewhat different in the two forms of leukæmia, Löwit does not believe there are two species. In one case it occurs only in the blood-making organs. In the other case both in the organs and in the circulating blood. The myelocytes, hypertrophic leucocytes, and atypical cells with nuclear and protoplasmic degeneration, are probably expressions of leucocytic parasitism, and are, therefore, wanting in lymphæmia. Transitional cases between lymphæmia and mixed leukæmia are observed and in these a certain number of leucocytic parasites are found, and in the organs the hæmamœba is discovered, principally between the cells, but in some measure also within them. In one case of infantile pseudo-leukæmia the author found a moderate number of amœboid bodies in the blood and large numbers in the spleen. They were almost entirely wanting in the lymphatic glands and the bone-marrow. This would seem to point to a relationship between lymphæmia and certain forms of pseudo-leukæmia. The author was unable to obtain cultures.

These very remarkable observations are unconfirmed. The very elaborateness of the morphological features alluded to makes the report questionable. Degenerations of leucocytes are common and might easily occasion misinterpretation. It must be added, however, that the author is a high authority on the question under discussion.

¹ Wien. klin. Wochenschrift, 1898, No. 20.

² Centralblatt f. Bakteriöl., 1898, xxiii., S. 206.

Congenital Leukæmia. L. Pollmann¹ records an interesting case of congenital leukæmia. The child, a female, had petechiæ upon the skin, was badly formed at birth, took nourishment badly, and easily became cyanosed. The liver and spleen were found enlarged when the child was fourteen days old, and examination of the blood showed a proportion of leucocytes to red corpuscles of 1 to 8. The petechial hemorrhages in the skin increased, and the temperature rose, finally reaching 41.5° C. just before death which occurred three days later. The liver and spleen were found greatly enlarged. The lymphatic glands were also enlarged, and the bone-marrow was splenified. There were small red points upon the tricuspid valves. Leucocytic infiltration was found in the organs and giant cells in the bone-marrow. The study of the leucocytes in the blood showed a majority of large mononuclear cells with relatively abundant protoplasm. Small and fragmented nuclei were also found. There were no nucleated red cells. Pollmann regards the case as one of true lieno-medullary leukæmia, and excludes von Jaksch's disease. He believes that it was congenital because of the cells observed at the time of birth. Cultures were made, but proved negative. On the other hand, the author accepts the evidence of endocarditis as indicative of some form of infection. The case is not satisfactorily reported, and cannot be accepted as a certain instance of congenital leukæmia.

Hemorrhages Into the Inner Ear. This complication, first pointed out by Pepper, has been found rather frequently in leukæmia, and occasionally, as in the following case, is recognized during life. J. Finlayson² describes a case of splenic leukæmia which occurred in a woman, twenty-nine years of age, in whom the interesting diagnosis of hemorrhage into the labyrinth as well as into the retina was made during life and confirmed after death. Shortly before the woman's death she had symptoms of a "cold" and had marked ringing in the ears, with giddiness and nausea, together with conjunctival ecchymosis. Hemorrhages were discovered in the retina, and since the external and middle ear were normal and the Eustachian tubes were readily inflated without improvement in the hearing, and as the onset was so sudden and accompanied by giddiness, hemorrhage into the labyrinth was diagnosed. Post-mortem there was found a hemorrhage in the vestibule and the first turn of the cochlea. The blood examination in this case showed 2,080,000 red and 1,190,000 white corpuscles.

H. A. Hare,³ in some further notes on certain cases of anæmias which he had reported before, refers⁴ to one case of spleno-medullary leukæmia which had improved remarkably under treatment, and when seen a year

¹ Münch. med. Wochenschrift, January 11, 1898.

² British Medical Journal, December 31, 1898.

³ Medical News, December 24, 1898.

⁴ Ibid., March 27, 1897.

and a half after the first report was apparently in good health and able to do a hard day's work, though there was a leucocytosis of 32,000 and over 2 per cent. of myelocytes still present. The improvement in health and its continuance seemed to be due to continuous administration of arsenic. A new case of "splenic anæmia" is also recorded. This ended in death, and the case is chiefly remarkable for the large size of the spleen and liver, the first weighing 5500 grammes and the liver 6300 grammes. [This case had previously been under another physician's care, and it was ascertained that the blood during that time showed the characteristics of leukæmia very strikingly. This illustrates a fact I have repeatedly observed, that the blood may undergo radical changes under treatment or independently of treatment. In some instances, when the number of leucocytes has become normal in this way, the continued presence of myelocytes reveals the nature of the case, as in the instance reported by Toulmine and Thayer some years since. I myself have seen this, but in a recent case found the differential count normal during a period of improvement, and the character of the blood not unlike that of pernicious anæmia. Subsequently the blood-picture of leukæmia returned and the patient died.]

H. N. King¹ reports a case of what he calls splenic anæmia in a young woman who had suffered with acute pharyngitis. The red corpuscles were reduced to 1,875,000, the hæmoglobin to 35 per cent. There was no leucocytosis. The spleen was enlarged, and the skin lemon-yellow in color. Later myelocytes were discovered and the lymphocytes increased in number.

Metabolism in Leukæmia. Chemical studies in leukæmia are of interest in showing active metabolic waste. It seems fairly certain that active leucocytic destruction accounts for the high values of uric acid and its congeners. A. Magnus-Levy² reports the results of his investigation of the metabolism in three cases of acute and in two of chronic leukæmia. In the acute cases there was the same striking loss of tissue nitrogen that has been previously observed. In one case there was a loss of 24.8 grammes of nitrogen, and the uric acid was increased to an enormous amount, the excretion in twenty-four hours being 8.72 grammes. The xanthin-bases were also increased, the amount in forty hours being 321 mg.; the ammonia showed no striking increase. The second case showed a nitrogen loss of 85.4 gm. in seven days; the uric acid was increased, varying from 1.2 gm. to 3.3 gm. The alloxur-bases were increased, but not at the cost of the uric acid since they never reached one-third its amount although estimated by the Krueger-Wolf method; the ammonia in this case also was not increased. The third case was examined throughout ten days; there could be no careful con-

¹ Ibid, March 5, 1898.

² Virchow's Archiv, Band clii., Heft 1.

trol of the amount of food ingested, but there was certainly an enormous excretion of nitrogen in spite of but slight ingestion, the total excretion in one day reaching as high as 27.3 gm., being always as great as 14 gm., and in most days above 20 gm. The uric acid varied from 0.85 gm. to 2.62 gm., and was at the highest point at the time when the leucocytes underwent a rapid decrease. The cases of chronic leukæmia showed but moderate evidences of tissue destruction and no striking increase in the amount of uric acid excreted.

Levy emphasizes the striking amount of tissue lost in cases of acute leukæmia in contrast with chronic leukæmia, which is largely due to the difference in the acuity of the process; but this is not always the case, and sometimes chronic leukæmia shows a marked loss of tissue nitrogen. Excessive excretion of uric acid is not the constant accompaniment of leukæmia, since Levy has collected a number of cases from reports, in which the amount of uric acid was little, if at all, above the normal. The relation between the amount of uric acid excretion and the variation in the number of leucocytes is, in his opinion, still very doubtful, and he thinks that any speculations upon this point are as yet decidedly premature. There is an unquestionable relation in some cases between nitrogen losses and hemorrhages. An example of this is seen in a case of purpura hemorrhagica which he reports. During excessive losses of blood in the course of the purpura, this individual had decided losses of nitrogen, which ran to as high a point as 13 gm. in the day. Therefore, some of the nitrogen-loss in leukæmia seems to be associated with hemorrhages. It has been proved that such nitrogen losses after hemorrhages are not due to the lack of oxygen and imperfect oxidation which leads to excessive destruction of proteids, for there is not a decrease of the oxygen intake and the carbonic acid outgo, but here is a sudden lowering of the oxygen tension which assists the tissues in extracting their oxygen from the blood, and this probably leads to the alterations in proteid metabolism. The determination of the ash-excretion in one of the cases of acute leukæmia showed enormous increase in the phosphorous excretion. In forty hours this ran beyond 15 gms., and was probably due to destruction of proteids and the excretion of the phosphorus which they contained. This is not sufficient to explain the source of the whole amount, however, since the excess of nitrogen excreted during this time would account for less than 6 gm. of the whole amount. Likewise it could not have come from the bones, excepting in small amounts, since the amount of calcium excreted is an indication of the amount of bone-destruction, and during this same period there was but 0.155 gm. of calcium in the urine. Therefore, it is probable that a considerable portion of the phosphorus came from nuclein, and that it was an evidence of the destruction of the nuclei of cells. In an exami-

nation of the blood of a number of cases for uric acid, he found in one case of acute leukæmia, which was, however, complicated with nephritis (which always causes an increase in uric acid), the enormous quantity of 22.6 mg. in 100 c.c. of blood; in another case of acute leukæmia, however, he found no uric acid present, though a large amount was found in the fluid in the pleura which consisted almost solely of blood. Hypoxanthin was present in every case, sometimes in large quantities; xanthin was present in traces only. The dried residue and total nitrogen of the blood and blood-serum were much decreased in both the acute and chronic cases, corresponding to the general loss of blood.

W. V. Moraczewski¹ has investigated the metabolism of a case of leukæmia and one of pseudo-leukæmia, determining the amount of nitrogen, phosphorus, chlorides, calcium and sulphur, ingested and excreted, and also determining the quantity of uric acid, urea, xanthin bases, and ammonia in the urine. It was found in the case of leukæmia that while on a mixed diet there was enormous retention of nitrogen, chlorides, phosphorus and calcium, the nitrogen and phosphorus retention being particularly marked. For the first it was 44 per cent. of the amount ingested, while of phosphorus 48 per cent. was retained. The case of pseudo-leukæmia showed a very striking retention of nitrogen, 36.7 per cent., and the chlorides and calcium were also retained in large amounts; the phosphorous retention was strikingly less than in the leukæmia, being only 4.4 per cent. Moraczewski speaks of leukæmia as a "nitrogen and phosphorous disease," meaning thereby that it is a disease in which the organism tends to retain large amounts of these substances. During his metabolism experiments upon the case of leukæmia, after giving the mixed diet without medication, the patient was given tablets of extract of spleen; the result was not notable as far as the clinical condition was concerned, but there was some increase of the leucocytes which probably indicated an increased destruction of the splenic tissue under the influence of the tablets. There was a notable increase of the ammonia and uric acid in the urine. After this the patient was given inhalations of oxygen; the nitrogen and chlorine excretion remained unchanged, while the phosphorus and calcium excretion became very much greater. The ammonia excretion became markedly lessened, while the xanthin bases and uric acid showed practically no change, nor did the sulphur. The uric acid, however, was slightly increased, while the xanthin-bases decreased somewhat. In the next period sodium chloride and calcium phosphate were administered; under the effect of these drugs the nitrogen retention was less, in striking contrast to chlorosis in which the same substances cause a nitrogen retention. The phosphorus excretion was also somewhat increased. But the most striking effect

¹ Loc. cit., Band cli. Heft 2.

was seen from the use of thyroid extract. This caused a very notable lessening of the nitrogen retention, the phosphorus reached almost an equilibrium, and during this time the patient's condition became very much better. The conclusion which the author reaches is that metabolism was imperfect in the case, and that it needed stimulation; he recommends the trial of thyroid extract in leukæmia for the purpose of producing increased nitrogenous metabolism. The results are at considerable variance with the conclusions of other investigators.

Pfeiffer¹ has investigated the fibrin of leukæmic blood. In earlier studies he has shown, as have previous investigators, that there is an increase of fibrin in cases of inflammatory leucocytosis. In his present investigations he found scarcely any increase of fibrin in three cases of leukæmia. Normal blood contains on the average 39.3 mg. of fibrin-nitrogen. In inflammatory leucocytosis he found as much as 142.3 mg. In leukæmia the average was 57.9 mg.

Changes in the Nervous System. Reference has been made to lesions of the central nervous system in various anæmias in the discussion of pernicious anæmia. The changes there referred to were degenerations. In leukæmia, beside such degenerations, actual leukæmic infiltrations may occur. H. Eichhorst² reports a case of leukæmia with interesting lesions of this sort. He has been unable to find a case similar to his in the literature. The patient, a boy of seventeen years, a blacksmith, presented himself with the history that he had suffered with some form of skin eruption in his seventh year, which lasted twelve months and was followed by an inflammation of one eye, leading to a white spot on the cornea. A second inflammation of the eye developed several years later, but soon subsided. The following year (1895) he observed an enlargement of the lymphatic glands in the right axilla, and in the autumn this reached considerable size. In February, 1897, enlargement of the glands in the left axilla began, and in the fall of that year swellings in the neck became obvious. Upon admission to the hospital, November 3, 1897, the patient was found with great swellings under the arms, and with enlarged glands in the cervical region, especially on the right side. The skin over these enlargements was freely movable and unaltered in appearance, excepting that some enlarged veins were visible. The patient's temperature was slightly elevated, but the pulse was regular and there were no distinct symptoms of any other sort. The spleen was slightly enlarged. Examination of the blood showed 3,600,000 red corpuscles, 41,650 leucocytes, and 54 per cent. of hæmoglobin; the blood stained with the triple stain, and with other aniline dyes, showed a preponderance of polynuclear cells (79 per cent.). The

¹ Centralbl. f. Innere Med., 1898, No. 1.

² Deutsche Archiv. f. klin. Med., December, 1898, Band lxi.

mononuclear cells numbered 16 per cent. ; the eosinophile cells were 5 per cent. No nucleated red corpuscles could be found. The patient was first treated with arsenic, but subsequently tablets of lymphoid-gland preparation were given. The arsenic had to be discontinued on account of diarrhœa, and the other remedy was absolutely without effect. On November 26, 1897, a heaviness in the legs with some difficulty in walking was observed. The reflexes were normal. On November 30th the patient could scarcely move his legs. There were no sensory disturbances and no alterations of the reflexes. On December 1st the patellar reflex was increased and paræsthesia was noted in the legs. The next day there was slight complaint of difficulty in voiding the urine. During a few days following the reflexes increased and ankylosis developed, then gradually grew less and disappeared. During the same time greater loss of power was observed, and the bladder and rectum both became incontinent. Streptococcic serum was injected, and after this some slight softening of the glands of the axilla became notable. The condition of the blood remained about the same. During the period from December 7th to 12th quantitative analyses of the urine were made to determine the urea, uric acid, sodium chloride, and phosphoric acid. The urea, sodium chloride, and phosphoric acid were greatly diminished ; the uric acid was present in practically normal quantity, and was, therefore, evidently in great relative excess. The patient finally died, and an autopsy showed a tumor of grayish character springing from the dura of the spinal cord in the region of the fifth and the seventh thoracic vertebræ, which caused compression with secondary degenerations of the cord. It evidently sprang from the peridural tissue, and was composed of small mononuclear cells, arranged in a soft reticulated form. The lymphatic glands were found somewhat cheesy and softened.

In speaking of the diagnosis of this case, the author does not hesitate to classify it as one of leukæmia, though he also mentions lympho-sarcoma. The occurrence of caseation and suppuration of the enlarged glands does not necessarily exclude leukæmia. In justification of this view he refers to cases of Slawjamski, Gowers, and Fränkel, and further suggests that possibly the injection of streptococcic serum may have caused the caseation in his case. The occurrence of small collections of round cells in the kidneys and in the liver further substantiate the diagnosis of leukæmia.

In referring to the various lesions of the nervous system that have been found in leukæmia, he calls attention to the fact that actual lymphomata have rarely been discovered. A case of interest in connection with his own is that of Rosenstein : A boy of seven years, suffering with pseudo-leukæmia, first had paralysis of the right leg and then of the left, and at the autopsy an infiltration was found in the lumbar and lower

dorsal region within the gray and white matter of the cord. This seems to have originated from the *substantia gelatinosa centralis*, and the commissure. It is of interest to note in this place an observation of Mosler's, published in 1869. In this a patient suffering from splenic leukæmia had tabetic palsy of the lower extremities, but no autopsy was obtained. This would appear to be the first reference to a distinct involvement of the central nervous system in leukæmia.

Treatment. W. Ewart¹ has used inhalation of carbonic acid gas in a number of cases of leukæmia. He states that the spleen became reduced in size and the whole condition improved, but the disease was not arrested, death was not prevented, nor was the leucocytosis controlled. He believes, however, that the temporary improvement was sufficient to indicate the occasional value of this treatment.

ACUTE LEUKÆMIA.

Acute leukæmia is a condition of considerable interest, especially as it furnishes data which may be of interest in solving the question of the etiology of chronic leukæmia. The frequency of the disease is difficult to estimate, as many cases are, doubtless, overlooked. The clinical history is quite uniform in most cases, and the resemblance to an infectious disease is often very striking.

Fussell, Jopson, and Taylor² contribute an interesting paper on acute leukæmia. This condition was first described in 1857 by Friedreich, who reported a case in which the duration of the disease was but six weeks from the beginning of the symptoms until death. Ebstein collected all of the cases up to 1888 in a monograph, and in 1897 Theodor reported a case, and collected abstracts of forty-four others. Fränkel, in 1895, reported eleven personal observations. Our present authors have reviewed the literature and have been able to add to this list and to correct it. Some of the cases contained in previous lists, they believe, were instances of leucocytosis only. Their present corrected tables contain fifty-seven cases, including two of their own.

CASE I. A woman of thirty-seven years, married, mother of six children, had a tuberculous knee when a young woman. She led a hard life and at the time of the onset of her illness had an eight months' child. She was perfectly well, however, until six weeks before she came under observation. She presented herself simply with loss of appetite and weakness, but had no other symptoms. She went to bed, and fever and diarrhoea developed. There were albumin and casts in the urine. The case continued for two weeks with all of the appearances of typhoid

¹ British Medical Journal, November 26, 1898.

² Philadelphia Medical Journal, January 7, 1899.

fever, but *anæmia* having become apparent, a blood examination was made which revealed the following figures: Red corpuscles, 1,184,000; hæmoglobin, 32 per cent., and white corpuscles, 241,333, which two days later became increased to 362,500. The patient developed small vesicles upon the nose and upper lip, the gastro-intestinal symptoms continued, and she died of *asthenia*. At the autopsy the spleen was found rather large and soft, the liver slightly enlarged, Peyer's patches were swollen and their centres ulcerated. The kidneys were pale and the seat of a parenchymatous degeneration. The bone-marrow of the ribs and tibiæ was wholly normal in appearance. The examination of the preparations of blood showed moderate poikilocytosis, about 2000 nucleated red cells per c.mm., nearly all normoblasts, and increased proportions of all the leucocytes excepting the eosinophile cells which were present in relatively greatly diminished, though actually in normal, numbers. The other leucocytes were all actually increased, but the relative increase affected the lymphocytes particularly, of which the percentage was 79.37.

CASE II. A girl of fourteen years came under observation in July of 1898, complaining of pains in the knee. There was no organic disease of the joint, and it was supposed that the complaint was due to nervousness. In August she was seen again, after having been more or less uncomfortable for a month, and her temperature was found to be 103.5°. There were painful enlargements of the lymphatic glands under the jaw which had not been present four days previously. The girl had also expectorated blood, but no lesion was discovered in the throat. The fever declined, but petechial spots appeared in the skin, and expectoration of blood continued. There were no abdominal symptoms. On September 3d the blood was examined, and it was found that the number of red corpuscles was 800,000; leucocytes, 134,000. There were 4615 nucleated red cells, all normoblasts. The differential count of the leucocytes showed an actual decrease in the polymorphonuclear elements (2035 per c.mm.), but an increase of all the other forms; the relative increase affected the lymphocytes particularly, of which there were 88.84 per cent. The child died, and at the autopsy the spleen was found to be somewhat enlarged and hard. There was slight prominence of the follicles of the gastro-intestinal tract, and the marrow of the ribs and sternum seemed to be rather more cellular than normal, but was not splenified. Microscopical examination in this, as in the other case, showed diffuse lymphomatous infiltration of various parts. In places there was a tendency to infiltration of the capillary walls and of the walls of the veins, as described by Benda.

Following the report of the case the authors analyze the features of the disease as derived from the fifty-six cases they have tabulated (one in their

tables of fifty-seven cases was in a calf). As to etiology, the streptococci that have been described in some instances are probably coincidental or indicative of agonal infection. In one instance direct contagion seemed to have been established. This was the celebrated one of Obrastzow. As far as age is concerned, they found 9 cases before ten years, 13 between ten and twenty, 10 between twenty and thirty, 7 between thirty and forty, and 5 after the age of forty years. The youngest subject was two and a half years old. The disease is one of earlier rather than one of later life, a majority of cases occurred in the male sex and the duration varied from three and one-half to sixty-three days, the average being approximately thirty-nine days. It is evident, and the authors point out this fact, that the duration cannot be definitely determined as some cases develop insidiously, and the time of onset is, therefore, uncertain. Hemorrhage occurred in thirty-seven of their series, and most frequently in the form of petechiæ. Nose-bleeding and hemorrhages from the mouth or other mucous membranes were common. Enlargement of the lymph-glands occurred in forty cases. Pain over the bones was a frequent symptom, and digestive disturbances were quite common; ulceration in the mouth and pharynx, and sometimes gangrenous lesions have been commonly alluded to by writers. Exudation upon the tonsils occurred frequently enough to make it a possible symptom. In thirty-one cases there was a rise of temperature, and in some cases this was a notable symptom.

Regarding the changes in the blood, they note that even in the earlier cases (though the same nomenclature was not used by the authors in describing their cases) it is evident that the mononuclear leucocytes were those most notably increased. As a rule, the red cells are markedly decreased, usually below 3,500,000, sometimes below 1,000,000. Alterations in the red blood-corpuscles are not so striking as in chronic leukæmia. The leucocytosis is usually moderate, and the striking characteristic is the presence of increased numbers of lymphocytes; these may be of variable size—sometimes much larger than red corpuscles, sometimes of the usual small size. All of these, the authors state, with Fränkel, are lymphocytes. They are inclined to the belief that the blood-picture of the disease may be slightly different from this, as Fränkel has recently admitted. Typical myelocytes are present in small proportion in most instances. The disease is probably the result of abnormal activity of the lymphatic tissues.

J. R. Bradford and H. B. Shaw¹ record five cases of acute leukæmia, with studies of the blood. The most interesting points are gathered in tabular form at the end of the paper. The ages of the patients were respectively thirty, fifty-eight, nineteen, seven, and seventeen years, and

¹ *Medico-Chir. Trans.*, vol. lxxxi. p. 343.

all occurred in males. The duration of the illness was from five to eight weeks. Purpura was present in 4 of the 5 cases; malæna in 2. Tenderness of the bones was recorded in 1; was absent in 2, and not observed in 2. The thymus gland was enlarged in 2; the condition of the gums was noted as diseased in each case, the onset of the stomatitis being from two to five or six weeks after the beginning of the disease. The bone-marrow was hemorrhagic in one case, and red and gelatinous in the same case, as well as in two others. In one case it was puriform, and in one its condition was not noted. The spleen was enlarged in 4 of the cases; the glands were universally enlarged in 2, and local groups were enlarged in the other 3 cases. The red corpuscles were decreased greatly in each case, and the hæmoglobin in about equal proportion. The proportion of the white to the red cells was 1 to 3 in one case at one of the examinations, and as low as 1 to 43 in another case. The remaining figures lay between these extremes. Differential counts of the leucocytes were made in 3 of the cases; the small lymphocytes were normal or reduced in 1 case, and reduced in the other 2. The large lymphocytes were greatly increased in each of the 3. Myelocytes were present in 2, and absent in 1. Eosinophile cells were present in 3. The polymorphous leucocytes were reduced in 2 cases, and are noted as absent in 1. Nucleated red corpuscles were not found in any case. Fever was present in each case in which the temperature was noted.

Clinically, these cases agree very well in type with those which have been previously described. It is of interest to note that the nature of the first case was detected almost accidentally, the blood examination first giving a clue. The other cases were recognized from their similarity to the first.

Gilbert and Weil¹ record three cases of acute leukæmia, one of which ran a course of three months, the second of five weeks, and the third of fifteen days. The first case was similar to chronic cases of the disease; in the second the whole course looked like infectious stomatitis, with enlargement of the spleen and lymphatic glands; the third case ran the course of an infectious purpura.

Hayem, in discussion, recorded his observation of a case of acute leukæmia in a pregnant woman, thirty years of age. The symptoms were those of purpura hemorrhagica, and were especially characterized by abundant hæmaturia, which was incoercible and finally caused death. Hayem had diagnosed purpura upon the first visit to the patient, but the casual examination of the blood was sufficient to show that it was leukæmia. There was a marked leucocytosis, nucleated red corpuscles were present, and the corpuscles were greatly altered in shape.

¹ Comptes-Rendus de la Soc. de Biol., December 31, 1898.

W. H. Thompson and J. Ewing¹ report a case of acute leukæmia in a woman of twenty-one years, who had had a sore-throat for six months previously, followed by repeated painful swellings of the arm, and later by pains in the body and limbs. When admitted to the hospital there was a high fever and the general appearances of internal hemorrhages. The spleen was enlarged, but the lymph-glands were not. Death occurred eleven days after admission. During this time she vomited repeatedly. The red corpuscles were 1,290,000, the hæmoglobin 20 per cent. The leucocytes, however, not counted, were estimated to be about 50,000. Myelocytes were present in a proportion as high as 32 per cent. There were no mast cells. Microscopically, infiltrations were found in the spleen, lymphatic glands, liver, and bone-marrow, and in the liver the cells showed marked karyokinesis. There were also foci of necrosis in the liver, but no bacteria were found.

HODGKIN'S DISEASE.

The close relationship between this disease and leukæmia is universally admitted, and many authorities regard them as identical. In some instances the occurrence of leucocytosis at the termination of a case of Hodgkin's disease has, doubtless, caused the belief that this disease had become transformed into leukæmia, and the following instance is illustrative of this fact:

H. Brooks² relates the history of a case of Hodgkin's disease which at the time of death showed a considerable degree of lymphatic leucocytosis in blood from the arteries. Previous to this time the leucocytes had been normal in number; the patient had shown marked cachexia, dyspnœa, and enlargement of the glands, the spleen, and the liver.

Menko³ reports two cases of acute Hodgkin's disease, one occurring in a woman at the eighth month of pregnancy, in whom the disease began in the form of a tumor in the left axilla. After removal of this tumor, neighboring glands became enlarged, anæmia and fever developed, and the condition was quite serious in appearance. Much improvement, however, occurred, though eventually a recurrence led up to a fatal termination. The second case occurred in a man of thirty-five years, who had marked constipation and whose spleen and liver were found enlarged. The blood was very anæmic. The lymphatic glands did not enlarge.

R. E. Horan⁴ reports a case of pseudo-leukæmia in a woman who had

¹ Medical Record, March 5, 1898.

² Ibid., December 17, 1898,

³ Deutsche med. Wochenschrift, March 19, 1898.

⁴ New York Medical Journal, March 5, 1898.

chronic mania. The lymphatic glands, the liver and the spleen were enlarged, and marked anæmia, with fever and vomiting, was present. Arsenic caused a reduction in the size of the glands, but eventually death occurred from hemorrhages from the mucous surfaces.

R. Abrahams¹ reports a case of "Hodgkin's disease with associated neuritis," occurring in a young man of thirty-five years, who first had lumps at the back of the head, and later evidences of multiple neuritis, with ataxic symptoms. Finally, progressive enlargement of the lymph-glands occurred, and the patient came under observation with great weakness, shooting pains, ataxia, loss of knee-jerks, and a girdle sensation. The pupillary reactions were normal, the sphincters were active, and the electrical tests of the muscles were normal. Glands began to enlarge, and the parotid as well as the lymph-glands became affected. The mammary glands also increased, and became the size of large oranges. No satisfactory examination of the blood was obtained and the nature of the case is certainly very doubtful.

PURPURA.

Few facts of importance have been added to our knowledge of purpura in recent years. Attempts to prove an infectious origin have usually started out from the assumption that all forms of purpura are of like character. As a matter of fact, it is most probable that very different sorts of disease are included under this heading. The following cases are of interest, though conclusions cannot be drawn from them without considerable reservation: The first is that of C. P. Kornreich,² who reports the case of a man of twenty-five years, in whom a marked purpuric eruption over a large part of the body persisted in spite of treatment. Specific treatment was instituted on account of certain facts in his history, and the purpura disappeared after a few weeks.

W. Johnson³ reports an instance of rheumatic purpura in a boy of twelve years who was anæmic and poorly developed, and who complained of pain in the knee, elbow, back, and abdomen. There was moderate fever, and subsequently the disease ran an irregular course of successive periods of suffering alternating with periods of relief. Each exacerbation was initiated by paroxysms of colic, with pains in the joints, and was followed by a purpura.

C. N. B. Camac⁴ describes a case of the same disease, in which there was extreme pallor though the blood examination showed 85 per cent. of hæmoglobin, 6,204,000 red corpuscles, and 22,000 white corpuscles. The

¹ Medical News, January 1, 1898.

³ Medical News, January 1, 1898.

² Medical Record, February 26, 1898.

⁴ Medical Record, December 24, 1898.

high blood-count with the extreme pallor was the interesting point of the case, and it is but another illustration of the fact that pallor and anæmia do not always coincide.

Pigmentary Cachexia. L. Cardeilhac¹ discusses what he terms pigmentary cachexia consecutive to purpura. He finds that following severe and repeated attacks of purpura one often observes a yellowish pigmentation of the organs, even when the ordinary causes, such as alcoholism, diabetes, malaria, and tuberculosis are absent. The study of these patches of pigment show that the pigment is produced *in situ*, though part of it is also produced in other portions of the organism, from hæmoglobin, and then carried in the blood-current to be deposited in the pigmentary areas. Traumatic ecchymoses may also give rise to this pigmentary cachexia. The result of this destruction of hæmoglobin and of red corpuscles may, in the author's opinion, be variable; for instance, he thinks that the accumulation of the pigment in the liver or in the pancreas may result in diabetes; he considers diabetes the result and not the cause of the cachexia. While the pigmentation is certainly secondary in alcoholism, malaria, and tuberculosis, he believes that these diseases act only indirectly, first causing destruction of the blood-corpuscles and interstitial hemorrhages.

INFANTILE SCURVY.

Infantile scurvy has occupied much of the profession's attention in recent years without any material result in the way of new discoveries. Statistical studies are still the most satisfactory contributions.

Bovaird² contributes an article on scurvy of infants, based upon statistical evidence. He refers to Crandall and Northrup's report in 1894, analyzing thirty-six cases, since which time only individual reports have been recorded in the literature. His own paper includes a tabulation of the cases since 1894, and he includes a number of cases not previously recorded, some having come under his personal observation, and others having been communicated to him by friends. The total number of cases is 64, making the entire number recorded in America 100. He refers to the fact that Rotch, of Boston, states that he alone has seen 60 cases. Of the 64 cases, the youngest was six months, the oldest two and a half years of age, the average being twelve months. Forty-five of the cases occurred in private practice, 12 in hospitals or dispensaries, and in 7 the record upon this point is not complete. In but one case were the surroundings of the patient strikingly bad. In nearly all of the cases there was pain, and generally this was so severe that every

¹ Thèse de Paris, 1897-98.

² Philadelphia Medical Journal, August 20, 1898.

movement of the physician or nurse was watched with fear. Pseudo-paralysis was found in 28 of the cases. The affection of the extremities was bilateral in 49 cases, and unilateral in 9; in 1 case there was no affection of the extremities, while in the remainder of the cases the location of the lesion was not mentioned. The mouth symptoms were very characteristic. A definite disease of the gums occurred in 52 of the 64 cases; in 2 cases the record is incomplete, and in 10 the gums were normal. Of this last group there is a definite record of absence of teeth in 2; in a third the child was but six months old, and it could be assumed that there were no teeth; in one case in which two teeth were present the periosteal symptoms were well marked, though the mouth was normal, and the results of the treatment were striking. In 21 of the cases there were hemorrhages into the skin; in 3 hemorrhage into the orbit producing a "black-eye," and other forms of hemorrhages occurred more rarely. Anæmia was reported in 14 of the cases, and marasmus in 7. Fever was present in 8 cases, and in 2 cases the temperature reached 105° and 106° degrees respectively. In 38 cases there is no reference to a relation to rickets, but in 16 cases signs of rickets were present, while in 10 cases they were definitely absent. In 5 of the 16 rhachitic cases the rickets was severe, and in 11 cases it was slight. As to the relation of diet, the author tabulates the form of feeding as follows:

Proprietary food, including condensed milk	.	.	.	.	.	32
" " " sterilized "	.	.	.	.	.	4
Sterilized cows' milk	.	.	.	.	.	15
Breast milk and other forms of feeding	.	.	.	.	.	3

The proprietary foods, therefore, still retain pre-eminence as the dietary cause. It is of interest to note that three of the cases occurred in children who were nursed, but in one of these the supposition that there was a specific taint had led to prolonged administration, almost to salivation, of mercury, and in addition analysis of the mother's milk had shown that it was deficient in every respect. In the second case, no details are given which would serve as an explanation. In the third the surroundings were very bad, but the mother had raised several other children under the same conditions without any ill effect. The milk was analyzed, and was said to contain: Fat, 4.5; casein, 2.1; sugar, 5.7; ash, 0.2. As the author states, no child receiving such milk should develop scurvy.

With regard to treatment, the author points out that fresh milk and orange-juice constitute the essential elements, and "nothing more is needed." Of the 64 cases recorded, but 2 died. Finally, he makes two inferences from these cases: 1. The contention that there is no evidence that scurvy has been caused by sterilized milk must be given up, as the evidence presented, though not classified yet, renders this

deduction highly probable. 2. It must be admitted that scurvy may develop in nurslings.

There is nothing to show that infection plays a part. Indeed, many of the known facts regarding environment and clinical course are strongly opposed to the idea of an infectious origin of the disease. On the contrary, the history and the results of treatment seem to show conclusively the relationship of diet.

Baron¹ reports a number of cases of Barlow's disease, and then discusses the nature of the disease in detail. The sudden onset, the elevation of temperature, the enlargement of the spleen, which was present in all of his cases, the absence of any cause of a predisposing sort, were among the conditions which led him to believe that the disease is probably infectious. He agrees with some others, that the absence of signs of rhachitis is sufficient to exclude this disease as having anything to do with the affection under discussion. The assumption of a scorbutic element in consequence of improper nourishment does not appear to him to be sufficiently established, especially as the nourishment of the child is often apparently normal, and the other necessary conditions to the establishment of a scorbutic condition are wanting. He is, therefore, inclined to view the disease as an infection, and the symptoms above referred to point in this direction. As far as the nature of the infectious element is concerned, and the peculiar conditions under which it becomes operative, but little can be said. The author's conclusions will not be received by many authorities as soundly established.

Zuppinger² discusses infantile scurvy, and notes that the various factors named in the etiology (disturbances of nutrition, damp and cold seasons of the year, badly arranged dwellings, overcrowding, etc.) are merely predisposing causes. The real immediate cause he believes is some infectious agent, as in the case of certain related hemorrhagic diseases. He himself reports two cases, one in a girl of three and a quarter years, and the second in a boy of one year. In both there was extensive hemorrhage of the skin, in the form of ecchymoses, and in one case in the form of pemphigus vesicles. Subsequently necrosis of the skin occurred in some of the affected areas. All parts of the body were involved, but especially the extremities. In addition to these lesions there were found upon the legs and forearms very painful swellings of the soft parts, of a smooth, often cedematous and reddened character. These swellings generally arose in crops, followed by hemorrhages. In one place fluctuation of the skin was discovered, and in one of the cases a distinct caput succedaneum. Altogether, the cases gave the impression of a scorbutic modification of rhachitis. The nature of these cases is

¹ Münch. med. Wochenschrift, 1898, Nos. 18 and 19.

² Wien. klin. Wochenschrift, 1898, No 17.

open to some doubt, and the author's views regarding etiology are also founded upon no certain data.

Naegli¹ records a case with fatal termination. The child was eleven months old, and had been fed with diluted milk, rice water, tea, and the like. The parents were healthy, but the surroundings were very unsanitary. Shortly before the child came under observation it had suffered emaciation, and three weeks before it was admitted pains in the left leg had begun. The left thigh was swollen and was exceedingly painful upon motion. The joints were free; there were no rhachitic signs, nor was there any eruption of the skin. On the fifth day after treatment the child suddenly died. There was found a moderate catarrhal pneumonia, and the periosteum of the left femur and left tibia was raised by subperiosteal hemorrhages. There was no separation of the epiphysis, but a true fracture of the epiphysis from the diathesis. There was complete separation of the fragments without any dislocation.

Joseph Collins² presented for diagnosis before the New York Neurological Society a doubtful case of infantile scurvy. The child, a girl of three years, born of healthy parents, presented about January 30th a swelling of the right eye, which was partially closed. The eyeball was shrunken and a discoloration was present around it as if a blow had been received. After two or three weeks the patient ceased to use the right leg and arm, and there was considerable tenderness over the right upper extremity, especially over the brachial plexus. These conditions disappeared, but the ocular symptoms returned after four or five weeks. The child was rather bright, but became irritable. Swellings, suggesting angioneurotic oedema, developed on the head. Restorative remedies were given during the summer, but her condition did not improve. At the time of her presentation (November 1st) she had fever almost continuously (about 103°); she was irritable, and occasionally had stiff-neck. Some of the swellings present on the head had proved to be negative by the microscopical examination. Dr. Mary P. Jacobi regarded the swellings as most likely subperiosteal hemorrhages, and believed the case to be one of infantile scurvy. This opinion was shared by several others who entered into the discussion, but Dr. Collins added that although this view had suggested itself, and antiscorbutic treatment and diet had been given, there was no result; the urine and blood had been examined without any definite findings.

¹ Korrespondenz Bl. f. Schweizer Aertze, 1897, No. 19.

² Journal of Mental and Nervous Diseases, January, 1899.

HÆMOPHILIA.

Nothing of any consequence has been added to previous knowledge regarding this disease. New therapeutic suggestions are made from time to time, but subsequent experience proves that the brilliant results which suggest their publication are accidental. Thus far no satisfactory treatment is known.

S. J. Ross¹ reports an instance of hæmophilia, in a subject twenty-eight years of age, in which there was hæmarthrosis which terminated in sup-puration.

Combemale and Gaudier² treated a case of hæmophilia with thyroid extract and noted a favorable influence.

W. H. Brown³ reports a very interesting case of hæmophilia. The patient, a boy of thirteen years, came under observation on November 6, 1897, with swellings of the outer side of the right thigh. The patient's mother had had fourteen children; seven boys and seven girls. Six of the boys were dead, all of them having died of bleeding. The girls were all alive and well. A girl on the mother's side died from bleeding from the stomach, and an aunt on the mother's side had a son who died at the age of fourteen years from bleeding. The patient himself had had many swellings of the joints, following slight injury, and had been under observation on three previous occasions suffering with bleeding after trivial injuries. When he was admitted to the hospital a needle was introduced and four ounces of bloody fluid were withdrawn from the swelling of the thigh. A firm pressure pad was applied, and iron was given internally. Subsequently hemorrhage from the thigh and bleeding from the nose and gums took place, and the patient grew excessively weak, so that his life was despaired of. At this time the inhalation of oxygen was begun, and in twenty-four hours the bleeding and vomiting had ceased, the boy was able to take milk freely, and subsequently the case progressed favorably. The author does not pretend to give any explanation of the physiological action of the oxygen beyond stating, in general, his belief that a lack of oxygen plays some part in the causation of conditions of this sort.

PAROXYSMAL HÆMOGLOBINURIA.

T. Fessler⁴ points out the fact that paroxysmal hæmoglobinuria is a rather rare disease in Europe, as there is no mention of it in Strümpell's

¹ British Medical Journal, April 2, 1899.

² Quatrième Congrès France de Méd. Intern., 1898.

³ Lancet, December 6, 1898,

⁴ Wjen. klin. Wochenschrift, July 30, 1898,

book, and Eichhorst states that there has been but one report of it in Russia and none in Switzerland. The present author, therefore, records the occurrence of two cases in his own practice as of some interest. The first case came under his observation in November, 1897. The patient, a man of sixty-five years, had drunk some very cold beer in the afternoon. Following this he had a chill, and some hours later passed blood-red urine. This he stated was the fifth time that this accident had happened within two years, following the drinking of cold beer. The examination of the urine the next morning showed little albumin, and no blood, but no microscopical report was made. Two months later the author was called to see a man of middle age, who had been exposed to cold and had had a chill, followed by the passage of blood-red urine. The patient stated that he had suffered with this trouble for some years, and particularly on one occasion some years before, when, after a very fatiguing march in military manoeuvres, he was seized with this trouble for the first time. He had been very fat but in two years had lost fifteen kilos. He did not use alcoholic drinks at all, and lived almost exclusively on milk. At the time he came under observation there was nothing found from his physical examination excepting the general evidences of anæmia. In the right inguinal region there was a small mass about the size of an egg, which was tender on pressure, but the skin in the neighborhood was not inflamed and there was no fluctuation. The urine contained little albumin. Heller's test showed considerable blood coloring matter, but the microscopical examination showed no red blood-corpuscles, but many phosphatic crystals and two hyaline casts. After a consideration of the nature of the case, active mercurial treatment was instituted, inunctions being employed, and the result was entirely satisfactory; the patient and the observer both being convinced that the disease was entirely cured. Though the patient denied specific history, the author was convinced that this existed, and the result of treatment seems to substantiate his belief.

E. Lichtenstern¹ describes a case of paroxysmal hæmoglobinuria which occurred in a youth of eighteen years. The patient had not had syphilis. The attacks, which were of brief duration and accompanied by various intense general symptoms, were always brought on by cold in the form of cold foot-baths or general exposure to cold, but could not be produced by exercise. There is no relationship, according to the author, between such general symptoms as chill, fever, enlargement of the liver, and spleen, hæmoglobinæmia, and pains, on the one hand, and the condition of the urine on the other. The urinary changes were sometimes absent or very moderate when the general symptoms were marked, and the

¹ Prag. Med. Wochenschrift, 1898, No. xxiii., 12 and 13.

reverse was also observed. Individual attacks differ very much in their character. Examination of the blood at the height of an attack showed no alterations in the corpuscles, and no change in the isotonic relations of the blood. With improvement of the general condition of the patient, Lichtenstern could discover no increase in the resistive power of the red corpuscles. The case was interesting, further, in presenting a constant polyuria, the daily amount being from 3000 to 5000 c.cm., and the specific gravity from 1011 to 1014. The author believes there was a neurotic basis for the malady.

I myself studied the isotonicity of the red corpuscles in one case, and found it decidedly lessened. The case passed out of observation before the attack had subsided, and I could not, therefore, determine whether the corpuscles regained the normal resistance or not.

THE EFFECTS OF SPLENECTOMY.

This has been practised in a number of cases with entire success, and with but little noticeable effect upon the general health. More or less anæmia is frequent, but marked anæmia of definite type has not been observed.

Ascoli¹ states that he administered 20 gm. per day of the pulp of calf's spleen to a young girl whose spleen had been removed, giving it in two doses a quarter of an hour before the principal meals. Under the influence of this treatment she regained her appetite, the excretion of nitrogenous end-products in the urine was almost doubled, her weight increased, and the number of red-blood cells became largely augmented. Arsenic and iron had been used before without any favorable results.

Von Beck² refers to six cases of subacute rupture of the spleen followed by splenectomy (L. Crop, 2 cases; Lane, 2 cases; Trendelenburg, 1; and Riegner, 1). Among these six cases, the last one recovered. The author himself now reports a case in a coachman, nineteen years old, who was run over by a heavy wagon, the wheels passing over his abdomen. The patient was conscious and had repeated attacks of severe vomiting. When received into the hospital he was anæmic to a marked degree, practically in collapse, and with a pulse of 140. The abdomen was distended and very tender. It was recognized that he had intra-peritoneal hemorrhage, and it was thought that this was due to rupture of the spleen. After giving an intravenous transfusion of 500 c.c. of salt solution, laparotomy was performed. About 700 c.c. of blood were taken out of the peritoneal cavity, and the spleen was then exposed. A

¹ *Gaz. Hebdom. de Méd. et de Chir.*, September 15, 1898, p. 1191.

² *Münch. med. Wochenschrift*, 1897, No. 47.

rupture was found upon the concave surface of the latter. After another saline transfusion of 200 c.c., extirpation of the spleen was performed, and the organ found to be 15 c.c. in length, 8 c.c. broad, and 4 c.c. thick. The rupture was 5 c.c. in length. Two other small ruptures were discovered. Recovery was prompt, without fever, and in four weeks the patient left his bed, and in ten weeks returned to his home, well.

DISORDERS OF METABOLISM.

ADDISON'S DISEASE.

Etiology. The causes of Addison's disease and the pathogenesis of that malady have become quite clear. There is no longer much room for doubt as to the fundamental seat of the disease, the dispute between those believing it to be the suprarenal bodies and those the abdominal sympathetic system, having ended in favor of the former. It is equally certain, however, that Addison's disease is not dependent upon any one kind of disease of the adrenal bodies, though fibro-caseous tuberculosis is unquestionably the most frequent cause. Malignant disease and various infectious processes, as well as hemorrhages or degenerations of the glands, may be met with. Syphilitic gummata have not rarely been encountered in the adrenals by pathologists, but their relation to Addison's disease has not been shown, except in a few doubtful instances.

F. Schwyzer¹ contributes a study of the etiology of Addison's disease, with especial relation to the connection between syphilitic tumors and atrophy of the adrenals to that disease. He reports three cases. In the first, a man of twenty-seven years who had suffered from syphilitic infection eight years before, began to have pain in the right hypochondrium, and afterwards severe vomiting, intestinal disturbances, great emaciation, severe cachexia, and after intense vomiting, exitus. The duration of his symptoms was one year. At the autopsy there were found a gumma of the right adrenal with old inflammatory adhesions, partial thrombosis of the vena cava, necrosis of a focus in the spleen, and syphilomata or scars in the liver and kidneys. There was universal atrophy, and brown atrophy of the heart, but no tuberculosis. The skin was not bronzed. In the second case, a woman of thirty years was not known to have been infected, but the husband admitted the possibility after her death. She was admitted to the hospital with marked ascites and cachexia, and died in twenty-four days. The pathological findings were syphilitic cirrhosis of the liver and gummatous scars of the kidneys, liver, and pleura. There were also specific lesions in the region of the right adre-

¹ New Yorker Med. Monatsch., 1898, vol. x., No. 1.

nal and in the fissure of the liver. The symptoms had been marked atrophy, jaundice and icterus, and during the last few weeks, disturbances of the stomach and cachexia. The third patient, a man of thirty-eight years, was admitted with a bronzed skin, ascites, considerable enlargement of the spleen and liver, and with a painful condition of the right side. There were digestive disturbances and great weakness. Syphilis of the liver and of the right adrenal was diagnosticated, and appropriate treatment ordered with the result that the enlargement of the liver and the symptoms markedly subsided. The ascites, however, continued, and repeated tapping was necessary. Subsequently the gastrointestinal symptoms recurred, and the patient died. The autopsy showed gummata in the liver and spleen, adhesions of the pleura, and scars and adhesions in the fissure of the liver and in the region of the right and left adrenals. In these cases there are, undoubtedly, signs which would justify a diagnosis of Addison's disease in the clinical sense, but at the same time the cases illustrate how insecure such a diagnosis may be, as the extensive abdominal affections in each case prevented positive determination as to the definite relationship of the adrenal disease to the general condition.

The relationship of malignant disease is discussed and very judiciously estimated by H. D. Rolleston and H. W. J. Marks¹ in a contribution on primary malignant disease of the suprarenal capsules. They refer to the clinical symptoms and discuss the general relations of malignant disease to Addison's disease. This question had previously been discussed by Rolleston in the Gulstonian Lectures for 1895. They very properly state that the general opinion is strongly against the belief that secondary malignant growths of the adrenals induce symptoms of Addison's disease, and they hold that this may be due to the fact that the primary malignant disease kills the patient before the symptoms have time to develop. Further, they add that the facts are much the same with regard to primary growths of the adrenals. In no case of primary malignant disease, as far as they could discover, did the entire clinical picture of Addison's disease present itself. Some of the symptoms, however, may occur. Pigmentation has been rarely observed. In Dickenson's case it was especially noted that during the last five or six months of life, brownish pigmentation of the face, neck and axilla, and some patches on other parts of the body developed. In Ogle's and in Fox's cases in children, the skin was discolored but not bronzed. Vomiting has been observed in a number of cases, including Ogle's, and asthenia was very notable in Afflect's and Leith's cases. It was mentioned as a symptom in several other reported instances.

¹ American Journal of the Medical Sciences, October, 1898.

The growing importance of experimental studies in internal medicine is shown by the relationship between the adrenals and certain symptoms, determined by experiments upon animals. Unfortunately, there is a disposition in some quarters to magnify the importance of experimental disease so established, in determining the nature of certain symptom-groups observed in man. E. Sergent and L. Bernard¹ record a case of sudden death in a patient who had presented the signs of an acute poisoning. At the autopsy the only lesion found was complete caseation of both suprarenal capsules. They think that there is evidence that beside Addison's disease there is an acute affection due to disease of the suprarenals, presenting a clinical syndrome similar to that resulting from the experimental removal of these glands, and following a fatal and often rapid course.

Symptoms. The difficulty of establishing a diagnosis of Addison's disease depends upon the fact that the symptoms are of such a sort that a number of affections might very easily be confounded with it. The peculiar discoloration of the skin, the vascular disturbances, the progressive asthenia, and the gastric disorders are the most characteristic of the symptoms; but many instances are met with in which these are not developed in cases which prove to be Addison's disease, and, on the other hand, cases are met with in which several of the symptoms may be strikingly indicative of Addison's disease, and yet the progress of the case does not warrant the diagnosis. It is desirable, therefore, to ascertain the characteristic symptoms and the relative importance of the various indications. A number of authors have called attention to the value of dark spots of discoloration upon the mucous membrane of the mouth. Neusser thinks them almost pathognomonic, but in a recent article in which F. Schultze² discusses the importance of melanoplakia of the mucous membrane of the mouth, as a symptom of Addison's disease, the author denies the importance of the spots, and states that in his clinic numerous small spots have been found on the hard palate in frequent instances when the patient presented no other signs of Addison's disease. They were seen especially in cases of carcinoma of the stomach and in diseases of the liver. The diagnosis of Addison's disease, in his opinion, must be established by the presence of bronzing of the skin and of the mucous membranes; but if melanoplakia is the only discoloration present the diagnosis cannot be considered as established, even when grave disturbance of the gastro-intestinal tract, severe prostration, and marked anæmia are present.

I myself have recently had occasion to confirm many of the statements

¹ *Comptes-Rendus de la Soc. de Biol.*, December 24, 1898.

² *Deutsche med. Wochenschrift*, November 17, 1898.

of this author in a suspicious case in which there was some discoloration of the skin, and in which tuberculosis of the lung was present. The mucous membrane of the mouth contained distinct blackish spots, and the diagnosis of Addison's disease might have been made had these spots been given undue significance. There were no other symptoms, however, and the case proved not to be of this nature.

Treatment. The management of cases of Addison's disease has received unusual study in recent years from the application of organic extracts in the treatment of disease. As I have already stated in referring to the etiology and pathogenesis of the disease, it is very likely that disturbance of the glandular function of the adrenal bodies is the important factor in the etiology of this disease, and we may, therefore, expect some action from the administration of extracts such as we are more familiar with in the case of the thyroid gland and diseases dependent upon its disorder. Experimental studies have certainly shown the activity of the suprarenal gland and extracts prepared from it. For example, Max Radziejewski¹ has found that a 10 per cent. watery solution of suprarenal gland causes increase of blood-pressure for about three minutes, followed by a decline of the pressure to the normal. The action is probably peripheral and upon the bloodvessels and the heart.

It does not follow, of course, that this activity is due to any specific products of the suprarenal gland, but taken in connection with the vascular disturbances met with in cases of Addison's disease, it is at least suggestive, and deserves consideration. Chemical studies have not thus far shown the nature of the principles contained in the suprarenal gland if any specific substances do exist in it, but J. J. Abel,² in some careful chemical examinations of the nature of the active principle of the suprarenal gland, has separated what he believes to be the active principle in the form of a benzoate, and has shown that it was neither pyrocatechin nor an immediate derivative of this. When pure, this active principle is a light gray powder, which has the formula $C_{17}H_{15}NO_4$. It is a basic substance which resembles the alkaloids, and which gives off an odor of skatol after being fused with powdered potassium hydrate and then diluted with water. The effects of the substance when isolated, however, differ markedly from those of the native substance as found in the suprarenal capsule, since the isolated base does not cause a rise in the blood-pressure.

It must be determined, of course, by future investigations, whether this substance is really the active principle or whether it is merely an ordinary derivative of the gland-tissue. Thus far the studies are only

¹ Berlin. klin. Wochenschrift, June 27, 1898.

² Bulletin of the Johns Hopkins Hospital, September-October, 1898.

suggestive. That the extracts of the suprarenal glands have a powerful effect upon metabolism seems more than likely, though the direct experiments to determine this point have not thus far yielded any positive or striking results. Senator, in an investigation of this sort, could not detect any distinct effect or any distinct alteration of metabolism, and in particular found the nitrogen and calcium excretion normal.

More recently M. Pickardt¹ has investigated the effect of extract of suprarenal gland upon metabolism when administered to a case of Addison's disease. He found that it caused a marked increase of proteid destruction, with a negative nitrogen balance and distinct loss of weight. This result is contrary to that obtained in Senator's case, and does not, therefore, prove that a nitrogen loss always occurs; it indicates, however, that further studies of the question should be undertaken before the remedy is freely used.

Of course these investigations are inadequate, inasmuch as they are concerned in but a limited number of cases and involve but a short space of time. A very slight alteration of metabolism would occasion very profound effects at the expiration of considerable periods of time, and these alterations might be so insignificant as to escape detection or would be counterbalanced by errors in the methods. The occasional good effects of the use of this remedy in actual practice, however, are shown by the reports which have been published from time to time during recent years, of which some of the following may be cited as characteristic. In connection with cases in which no result is achieved it should be remembered that the preparation of the gland plays an important part in the matter of success or failure of the treatment, and that the duration of the disease may have an important bearing, as in the case of cretinism and myxœdema and thyroid treatment.

Schwab,¹ Suckling,² Bécclère,³ and Courmont⁴ have used suprarenal glands in the treatment of Addison's disease. Schwab reports two cases, but the result was most unsatisfactory. Suckling reported one case, with extremely striking improvement, so that by the end of the year the patient was well. He used 10 grains of suprarenal gland daily in tablets, increasing the amount up to 200 grains. Bécclère treated a man who had suffered with the disease for three years, with some improvement in the general condition. Courmont administered the substance subcutaneously, and the patient died within twenty-four hours, probably as the result of intoxication. He believes that subcutaneous adminis-

¹ Berlin. klin. Wochenschrift, August 15, 1898.

² Journal of American Medical Association, March 26, 1898.

³ Boston Medical Journal, April, 1898.

⁴ Société Médicale des Hôpitaux, February 25, 1898.

⁵ Quatrième Congrès France de Méd. Intern., 1898.

tration of the remedy should not be attempted. Hayem, in discussing Bécclère's paper, remarked that he had treated a case of Addison's disease with the fresh gland, and had observed improvement in the general health, but not in the pigmentation. Gallaird found the treatment useless in one case. Widai found slight increase in strength in one case, but no other effect, and after a little while the stomach became intolerant of the remedy.

F. Robin¹ has been able to follow for a long time the case of Addison's disease with tuberculosis, previously published by Bécclère. The pigmentation of the skin had been considerably decreased, and good health had been preserved for three years after the administration of extract of suprarenal. The results from the use of this gland differ from those following the administration of thyroid in the fact that any improvement is likely to persist after the suspension of its use. The author believes that the use of suprarenal gland causes a compensatory hypertrophy of any healthy suprarenal parenchyma which may be present.

As far as the manner of administration is concerned I must again allude to Courmont's experience, and warn against subcutaneous administration, though Hemet² advises this method. The treatment should be continued a long time if permanent good is to be obtained. Hemet, as I have just stated, believes that the treatment may be carried out by means of subcutaneous injections, as well as by administering the gland by the mouth. The latter is preferable, fresh gland taken from calves being administered in doses suited to the individual's susceptibility. In all cases the treatment must be continued for a long time, with occasional interruptions. Hemet attributes the numerous reports of lack of success from this treatment, to the use of imperfect preparations of the gland or to preparations which contain toxic substances. A careful analysis of cases reported to the present time makes it quite likely that suprarenal treatment will prove valuable, but there is as yet no certainty about the matter.

It must, however, be distinctly admitted that suprarenal treatment alone is not adequate to the management of this condition. The following interesting paper may be cited in connection with this statement: A. F. Plicque³ insists that the first indications are rest, a proper climate in which plenty of fresh air may be obtained without exposure, and the administration of such food as the patient can bear, the greatest difficulty with the latter indication being that the kidneys are very likely to be insufficient and the gastro-intestinal tract very easily upset. It is

¹ Thèse de Paris, 1897-98.

² Ibid.

³ La Presse Médicale, January 4, 1899.

best to begin with liquid diet, later adding the yolks of eggs and white fish, and subsequently other foods. Inhalations of oxygen have given good results in the treatment of some symptoms, especially the incoercible vomiting; counterirritation over the stomach has also been useful in combating the vomiting. Sulphur baths are useful, especially when associated with massage of the surface, but cold baths are distinctly contraindicated. Electricity is valuable for the pains, using either the static bath or faradization. Galvanization of the pneumogastrics sometimes does much good in uncontrollable vomiting; but, after all, electricity has no especially happy effects. The best remedies are strychnine and arsenic, but these should be interrupted now and then.

Owing to the occasional occurrence with syphilis of symptoms similar to those seen in Addison's disease, it is sometimes advisable to use specific treatment, but this must be done with great care. In addition to such general measures the author discusses the use of extract of suprarenal gland and advises that the dried gland in capsules or the fresh glands be given.

DIABETES MELLITUS.

Definition. Notwithstanding the abundant studies and the increasing knowledge of the nature of diabetes no accurate definition can be given, and authors are still at variance. The demonstration of the fact that grape sugar or a body clinically closely allied to it is a normal constituent of the urine, has made it apparent that the distinction between glycosuria and diabetes could not be based upon the permanency of the symptom. Neither can any distinction be based upon the effect of the administration of glucose and the resulting conditions of the urine. Some recent authors evade the question in a measure by describing cases of mild and severe diabetes. It is undoubtedly true that cases of very different grades of severity are met with, but the tendency caused by such a classification is to include every doubtful case of simple glycosuria under the head of mild diabetes. The whole subject is thoroughly discussed by Naunyn,¹ in his book on diabetes mellitus, who contends that all continuous glycosurias are diabetic. Among the non-diabetic or transitory glycosurias he includes "alimentary glycosuria e saccharo," which may occur in diabetics or in non-diabetics, and toxic glycosurias, such as those produced by carbon-monoxide, various narcotics, phloridzin, etc. Beside these two varieties of true glycosuria, there are forms of mellituria, such as lactosuria of pregnancy and of the puerperium, and a form of glycosuria, the so-called cholera glycosuria, all of which he holds are in no

¹ Nothnagel's *Specielle Pathologie und Therapie*, Bd.vii., Th. vi.

way related to diabetes. All other forms of glycosuria suggest diabetes mellitus, and as the actual diagnosis between transitory and diabetic glycosuria is exceedingly difficult, the greatest possible care must be taken in declaring any case of glycosuria as non-diabetic. The author is particularly insistent upon a distinction between alimentary glycosuria and *alimentary glycosuria e saccharo*. The former represents glycosuria which makes its appearance in consequence of excess of carbohydrate diet. The latter is produced only by a direct administration of considerable quantities (100 grammes) of glucose or some other form of sugar, after a certain period of abstinence from food. The simple alimentary glycosuria is always an indication of diabetes. The other form may or may not be associated with diabetes.

It does not seem to me that the views of the author are well founded in all particulars; especially does it seem that his distinction between dietetic glycosuria and *glycosuria e saccharo* is based upon no demonstration that they represent an important difference.

Germain Roque,¹ in discussing the same subject, states that diabetes mellitus constitutes a clinical entity composed of multiple symptoms, including glycosuria, polyuria, polydipsia, polyphagia, and a clinical course tending to a fatal termination. Diabetes was known before glycosuria had been discovered, and recently diabetes without glycosuria has been described. He believes the problem of defining the terms diabetes and glycosuria is much the same as that which presents itself when the attempt is made to define accurately the term albuminuria. However, the problem is rather more complex in the former case. Diabetes is not characterized by any peculiar anatomical or pathological conditions, nor by any specific organic lesion. It is wholly a clinical syndrome with variable etiology and pathogeny. He offers, in his work, the following classification for conditions which are sufficiently protracted to simulate real diabetes: (1) Intermittent glycosuria of arthritic subjects; (2) digestive glycosuria; (3) nervous glycosuria; (4) puerperal glycosuria. Each of these may again be subdivided. All such discussions lead to but one practical result. Cases of intractable glycosuria will be called diabetes, whereas manageable cases will receive the name simple glycosuria. To point to similar difficulty in the definition of albuminuria does not wholly satisfy us. In the case of albuminuria we are at least in possession of facts which indicate several possible ways in which albumin may appear in the urine; in the case of glycosuria no such diversity is recognized. In other words, we do not know of any essential difference in so far as the act of excretion is concerned, while the matter of origin of the sugar is certainly very obscure. Further, we might call attention to the fre-

¹ Les Glycosuries Non-Diabétiques, Paris, 1899.

quent transformation of "mild" into "severe" diabetes, as Lenne¹ has recently pointed out.

Etiology. The actual causes of diabetes are probably numerous, at least it is certain that a number of distinct factors enter into the etiology. It is difficult, however, to determine the importance of the various causes in individual cases or to demonstrate the manner of operation of the causes. Undoubtedly diet, heredity, and habits have much to do with certain cases, as was found, for example, by Funaro² in his account of the frequency of diabetes in Tunis. He alludes to certain facts which at least partly explain this frequency. As elsewhere, the disease occurs especially in men, and particularly affects Hebrews. The fact that Hebrews throughout the world are more subject to this disease is attributed to their following sedentary occupations, eating freely, particularly of sweets, and to the fact that their frequent intermarriage renders the children singularly liable to hereditary diseases. The race of itself seems to have no special tendency to acquire the disease, since Menotti has noted that the Arab tribes who live a roving life outside of the cities seem to be entirely free from it. In Tunis the special causes of the disease appear to be the excessive use of amylaceous substances and sweets in the food, and, in the second place, the extremely sedentary life with entire lack of exercise, and the unhygienic conditions under which the people live. As proof of this he notes that among the soldiers, who are obliged to take exercise, diabetes is practically unknown. Alcoholic abuse seems to have little importance in the etiology, for the Israelites are not given to excessive use of wine, and they are the especial subjects of diabetes.

Funaro has investigated the possibility of the disease being sometimes due to malaria. He has observed, however, but one case in which this might be considered possible; he also notes that the disease is uncommon in those portions of the country in which malaria occurs with special severity. He insists upon the great importance of heredity, and gives a table which presents in brief the history of one family in which fourteen cases of diabetes had occurred; five of these were considered conjugal diabetes, as they occurred in persons who belonged to the family only by matrimonial alliance. The disease is frequently associated with obesity also. The climate is not believed to have any distinct relation to the frequency. The affection follows a mild course, and under proper treatment shortens life but little. It is interesting to note that pulmonary tuberculosis is very rare in connection with it, Tunis showing, in general, a notable degree of exemption from tuberculosis.

All of these statements accord with general knowledge, especially the

¹ Deutsche med. Wochenschrift, 1898, No. 32.

² Gaz. Méd. de Nantes, August 6, 1898.

asserted relationship of heredity and diet to the disease. The exact nature of the altered relations toward diet are but little understood. That there is difficulty in the digestion and consumption of carbohydrates is, of course, recognized; but opinions differ as to the exact nature of the difficulty. In some instances it seems most likely that the carbohydrates are too readily passed through the absorptive surfaces and organs (intestines and liver); in other cases the difficulty appears to be a deeper one and dependent upon disorder of the mechanism which disposes of carbohydrates after their absorption; in still other cases it has been contended that renal disease accounts for the excretion of sugar that should normally be kept within the system or transformed by the kidneys. The theory has seemed an attractive one, that mild and severe diabetes differ in that the former shows no tendency to continuous glycosuria when the carbohydrates are withheld from the food, while the latter is not so influenced. In the severest cases it would seem that the carbohydrates cannot be retained, but are at once excreted, though some authorities believe the power to consume carbohydrates is partly retained even in the severest cases. The recent investigation of T. Rumpf,¹ however, seems to show that there is, in some cases, no power to assimilate carbohydrates, as obtained in four instances of severe diabetes in which he determined both the amount of carbohydrates ingested and the amount excreted, and found that there was absolutely no retention of carbohydrates, the outgo oftentimes exceeding the intake to a considerable amount. In these cases, therefore, the power of assimilation of this form of food was proved to have been either occasionally or permanently lost. In such cases the carbohydrates do not prevent nitrogen waste, for Rumpf in one case determined the amount of nitrogen ingested and excreted, and found that the latter was not at all limited by the use of the carbohydrates. He explains the persistence of the loss of nitrogen, even after carbohydrates are stopped, by the fact that increased excretion of sugar through the urine persists even after the patient stops the use of carbohydrates, and this loss of sugar must be replaced by a considerable amount of conversion of the albumins of the body. He insists, finally, that in cases of diabetes which are so severe as to have absolutely no power of assimilation of carbohydrates, the use of bread, milk, and similar foods must be absolutely forbidden, at those times, at any rate, during which the sugar excretion exceeds the amount of carbohydrates ingested.

The Relationship of Diabetes, Gout, and Obesity. This question has been frequently discussed, and most authorities are agreed that there is some sort of relation. This is proved by the fact that in certain

¹ Berlin. klin. Wochenschrift, October 24, 1898.

families obesity, gout, and diabetes are frequent, the children of gouty parents being diabetic or obese, and again begetting gouty offspring. The exact relation of these affections is, however, not certainly determined, and I cannot agree with Hirschfeld,¹ who explains their frequent association by the fact that fat persons have a common habit of eating excessive amounts of food and of taking insufficient exercise. In support of this view, he notes the fact that among the well-to-do members of society, leading sedentary lives and eating freely, diabetes is more common than in the poor.

W. Ebstein² takes a broader, and, I think, a more just view of the relation between obesity, gout, and diabetes, though it might be said that his opinions are as yet merely theories. Two or all three of the diseases named are frequently observed in the same person, all really belong to the constitutional diseases, and all are frequently hereditary. There is no evidence in Magnus-Levy's work to prove that there is a diminished combustion of tissue in obese persons, since there is no diminution in the respiratory exchange, so that the condition must be referred to some abnormality in the protoplasm of the cells; in gout there are disturbances of the excretion of uric acid, and this substance is derived from the nuclei of the cells, so that here, too, there is certainly some cell disturbance. The same is true of diabetes, glycogen in this disease being found in tissues in which it does not normally exist. Ebstein considers all three diseases as general diseases of protoplasm, all of them being sometimes transmitted by heredity.

The Relationship of Nervous Diseases and Injuries to the Nervous System with Diabetes. This is not definitely settled, though there is no doubt some close connection in certain cases. The experiments of Claude Bernard and those who have repeated his work still lack positive interpretation, and the nature of the so-called "diabetic centre" wants determination. Cases of diabetes in association with various forms of nervous disease are reported from time to time in the literature, and transient glycosuria may accompany diseases of the nervous system as well as other diseases. It does not follow, however, that the nervous condition is the cause of the diabetes, nor even that the two conditions are related in any way.

W. Ebstein,³ in discussing the relation between epilepsy and glycosuria or diabetes, refers to several cases in his experience. As he states, the two conditions may be coincidental, the convulsive disease may be dependent upon the diabetes, or the reverse. A fourth possibility is to

¹ Berlin. klin. Wochenschrift, March 7, 1898.

² Deutsche med. Wochenschrift, November 3, 1898.

³ Ibid, January, 1898.

be considered, viz., that both conditions may result from a single lesion of the central nervous system.

Roget and Balvay¹ record a case of diabetes of considerable interest in connection with this question. The patient had a specific history, was an alcoholic, and was excessively nervous and irritable; he had been the subject of severe malaria, and had received an injury to the head which had resulted in several hours of unconsciousness. His chief complaint upon admission was pain over the whole left side, the pain being likened to that produced by a constant current of very cold water. There was no disturbance of the tactile sense on this side, but the sense for heat and cold was inverted. He had an auditory hallucination, suggesting the sound of a locomotive going at full speed. The corneal reflex was abolished, but there was no disturbance of the color fields; later, however, he presented hysterical attacks, and at times hysterical convulsions. There was a large amount of sugar in the urine, and acetone, diacetic acid, and oxybutyric acid were present; there was marked œdema of the legs. A few days after admission there was slight left-sided facial paralysis, and the following day he fell into coma, the urine being almost suppressed. There are several possible etiological factors in this case. The trauma may have been important, as may also the general nervous condition, and the habits of the patient. There is, unfortunately, an embarrassment of riches. Even the syphilitic taint of the patient must be considered.

The Relation of Syphilis to Diabetes. This subject has recently been considered by Manchot² in a critical review of the literature bearing upon the occurrence of essential syphilitic diabetes independent of local lesions of the central nervous system. He reports four illustrative cases, in two of which gummata were present, and in which active treatment with inunctions of mercury and the administration of iodide of potassium caused relief both of the diabetes and of the gummata. In the two other cases there were tertiary lesions, and autopsy showed considerable atrophy of the pancreas. The author is of the opinion that this pancreatic disease was strictly syphilitic, and that the association, therefore, was not merely accidental. In 12 among 359 syphilitic persons the author found transitory glycosuria which could be ascribed to no other cause than the syphilis. In one case this occurred a short time before the first generalized symptoms, in eight cases simultaneously, and in the rest subsequently. He regards this transitory glycosuria as a part of the syphilitic disease of the general organism, and believes that it may be occasioned by reparable diseases of the pancreas, and possibly also of the liver.

¹ Lyon Médical, January 8, 1899.

² Monatsh. f. Prakt. Dermat., xxvii., Nos. 5 and 6.

While I cannot entirely agree with the wisdom of determining the syphilitic nature of a glycosuria merely by the absence of an adequate explanation of any other kind, I do accept the possibility of syphilitic disease of the pancreas having a part in the causation of diabetes. No certain instances, however, have thus far been recorded of syphilitic disease of the pancreas or liver as the cause of diabetes. A number of suspicious cases may be cited, and Naunyn¹ records four cases of his own after quoting a number from the literature.

The Relationship of Hepatic Disease and Diabetes. This is recognized to be close. Some authors, as Glenard, have regarded hepatic disease as of prime importance. This view, however, seems an extreme one; it is more probable that the association of diabetes and disease of the liver is only occasional. The form of "hepatic diabetes," recently discussed by a number of French authors, as Hanot and Chauffard, Hanot and Schlachmann, Letulle, and others, is but a variety of hepatic disease with diabetes and probably not an independent disorder.

Naunyn,² in his work upon diabetes mellitus, in discussing the relation of glycosuria and diabetes to diseases of the liver, details his experience at his clinics in Königsburg and later at Strassburg, and in his private practice during the last five years. Among 70 cases of diabetes at Königsburg but one showed cirrhosis of the liver at the autopsy, and one an enlargement of the liver—a tumor of the gall-bladder following cholelithiasis (carcinoma of the liver?). Among the 58 cases at Strassburg there were 6 certain and 2 uncertain cases of cirrhosis of the liver. In his private practice at Strassburg he found among 158 cases, 22 in which he could determine the clinical signs of beginning cirrhosis of the liver, and 2 cases in which there were signs of advanced cirrhosis; in addition, there were 10 cases with the secondary changes in the liver following heart-failure (myocardial), and 4 cases of liver disease following gallstones. Altogether, then, among the 158 cases there were 38 with disease of the liver. He explains the discrepancy in his observations in different places in the following way: In the first place, the cirrhosis and the circulatory changes in the liver are much more frequent among the people who supply his Strassburg clinic and his private practice than among those living near Königsburg. The greater frequency of diabetes in association with cirrhosis of the liver in private practice is explained by the fact that in his cases he was dealing with beginning or very little advanced cirrhosis. Among the thirty cases which he has seen there were altogether only five in which there was distinct ascites. The condition of nutrition, he holds, is of some importance, as it not infrequently

¹ "Diabetes Mellitus," Nothnagel's *Specielle Pathologie und Therapie*, 1898, Bd. vii. Th. vi.

² *Loc. cit.*

happens that diabetic patients who have been greatly reduced by cirrhosis of the liver cease to have an excretion of sugar, and the diabetes is thus overlooked. The patients observed in private practice were generally in a condition of good nutrition, which was very strikingly in contrast with those of the patients presenting themselves at the clinics. This explains the fact that seldom, in cases of cirrhosis of the liver which come to autopsy, is there a clinical history of diabetes. He points out that among forty-four cases of liver disease in association with diabetes there was not a single one in a woman.

The Relationship of Renal Disease and Diabetes. This is interesting in connection with the subject of renal diabetes. Jacobi showed that sugar is excreted in the urine of animals in which excessive polyuria was induced by drugs, such as theobromin, and Klemperer recorded a case of glycosuria in a man suffering with nephritis. In this case the amount of sugar in the blood was said to have been no greater than normal. Association of renal disease and diabetes is assuredly not a rare condition, but the nature of the association requires determination.

G. Mascarel,¹ in a study of the lesions of the kidney and of albuminuria in diabetes, particularly insists that the amount of sugar excreted is not necessarily proportionate to the hyperglycæmia. There is frequently a slight degree of glycosuria coincident with a marked hyperglycæmia, and this is due to a defect in the permeability of the kidney. The author insists upon the importance of determining the degree of permeability of the kidney in establishing the prognosis in diabetes. This factor is determined by subcutaneous injection of methylene-blue, as the administration of this dye by the mouth and the observation of the time of its appearance in the urine is not sufficient to determine the condition of the kidney, since the rapidity of gastro-intestinal absorption is not considered in this method. Oftentimes one finds large quantities of sugar in the urine when there is little or no hyperglycæmia; these cases are those that have received the name of renal diabetes. They have been explained by attributing them to excessive permeability of the kidneys, to special irritation of the kidney by some irritant substance in the blood, and to the arrest of a function of the kidney parenchyma, which normally should absorb this sugar. Mascarel concludes that there is as yet no sufficient reason for stating that any such renal diabetes exists.

In discussing the same subject Naunyn² rather inclines to the belief that renal diabetes may exist as an independent condition, and cites several cases of coincident renal disease and diabetes, and refers to the occurrence of glycosuria in hæmaturia and chyluria, reporting cases in evi-

¹ Thèse de Paris, 1897-98.

² Loc. cit.

dence. We cannot reach any positive conclusions except from scientific investigations of the amount of sugar in the blood and urine, and conclusive studies are still wanting.

Studies of the permeability of the kidney may possibly yield some results if pursued in a large series of cases, but have not thus far given data of any consequence, as authors have generally studied only a few cases. Troisier¹ has taken up the question by making injections of methylene-blue, with the result that he found the permeability normal in one case, notwithstanding the daily excretion of 20 litres of urine containing 1 kilo of sugar.

The occurrence of albuminuria as a consequence or complication of diabetes is discussed by K. Grube,² who finds that albuminuria is most frequent between the ages of fifty and sixty years, and also in the eighth decade of life, as 43 per cent. of the cases of diabetes occurring at this period presented this symptom. Five distinct classes may be recognized: 1. Albuminuria in the severer forms of diabetes. The albumin is nearly always present in the urine in the last stages of such cases when diabetic coma is present; it is a slight albuminuria, but frequently increases rapidly up to the time of death. 2. Congestive albuminuria, caused by failure of the heart and congestion of the kidneys; this was present in three cases. 3. Senile albuminuria, due to slight arterio-sclerosis of the small vessels of the kidney, is met with in any person over seventy years, and, according to the author's views, in diabetic patients it comes on a little earlier in life. The albuminuria is slight, and there are no casts. Sometimes the albuminuria is intermittent. 4. A functional albuminuria; this is always slight, and occurs in cases of diabetes in which a large quantity of sugar is passed for a long time. Reduction of the amount of sugar sometimes causes disappearance or diminution of the albuminuria, and the author concludes that the sugar acts as an irritant to the kidneys. 5. Albuminuria due to chronic disease of the kidneys may be the direct result of the constant excretion of urine containing sugar, and is of the interstitial variety. It is more common in men than in women. In a general etiological way, the author states that three causes are operative in producing albuminuria in diabetes, namely, arterio-sclerosis, gout, and alcoholism.

Diabetic Xanthoma. J. Schwenter-Frachsler³ describes a case of diabetic xanthoma from Unna's clinic, and reviews the literature of the condition. With this as his authority, he constructs a clinical history as follows: The patient is generally corpulent, and is subjectively in good health. The disease is most frequent in men, and in persons of middle

¹ *La Presse Médicale*, 1898, No. 12.

² *British Medical Journal*, July 23, 1898.

³ *Monatsh. f. Prakt. Dermatol.*, 1898, vol. xxvii., No. 5.

age. The urine contains either glucose or pentoses. The eruption arises rapidly and disappears in the same way, though it may remain for months or years before its subsidence. It consists of rather hard indurated nodules with a yellow top and red edges, which are sharply circumscribed and embedded in the skin. The fresh eruptions may be entirely red, but the yellow centre may be visible with the aid of the diascopé. The red edge is most marked in fresh lesions, and later gradually grows less marked. The eruption is most frequent on the extremities, especially the extensor surfaces, and also involves the buttocks and the back. The eyelids are involved, as are also the palms of the hands and soles of the feet and the genital regions. The size of the spots varies from that of a millet seed to a pea, and later, flat plaque-like lesions, as large as a silver quarter at the maximum, may be found. No connection can be shown between the eruption and the hair follicles, and this independence is emphasized by typical eruptions on the palms and soles. The prognosis is generally good, and the disappearance of sugar from the urine is usually accompanied by an improvement in the condition of the skin, though relapses are common.

Acute Diabetes. Boehm¹ records a case of "acute diabetes," which occurred in a boy of seventeen years. He had felt somewhat unwell for two or three weeks, had been languid, excessively thirsty, and had passed urine in unusually large quantities; he had also complained of headache and vertigo. Four days after the first notable symptoms he suddenly fell into diabetic coma and died. The post-mortem showed adherence of the dura, internal hydrocephalus, chronic parenchymatous nephritis, and atrophy of the pancreas. Cases of this sort cannot be described as "acute," except in instances in which careful examinations had been made for some time before the onset of actual diabetic symptoms. In many cases sudden increase of urgency of the symptoms takes place, though the diabetes had existed a long time. In the case of Parry this sudden onset of terminal symptoms in a previously latent case is well illustrated. This observer reports² the case of a woman, sixty-eight years of age, who, he believes, died of diabetic coma without having presented any previous symptoms. She fell suddenly and became comatose, and had contracted pupils which reacted but slightly; knee-jerks were absent; the urine and feces were passed involuntarily; the heart was normal. Urine obtained some hours after the attack came on was acid, contained a trace of albumin and a great deal of glucose. Death occurred twenty-six hours after the onset of the coma, which was believed to be diabetic, apoplexy being considered improbable because of the normal condition of the heart, the lack of

¹ Münchener med. Wochenschrift, August 30, 1898.

² Lancet, November 26, 1898.

accentuation of the aortic sound and of increased vascular tension or signs of atheroma. There were no signs of syphilis, and epilepsy was apparently not present since there were no convulsive movements.

Pancreatic Disease and Diabetes. Of greater interest than the question of hepatic diabetes is that regarding the association of pancreatic disease and diabetes. This has long since passed the experimental stage, as we may show by the fact that in a number of cases published in the medical literature disease of the pancreas has been recognized during the life of the patient by the occurrence of glycosuria and associated symptoms pointing to disease of the pancreas. Among the symptoms we may include, with Naunyn, fatty stools, disturbance of the absorption of proteids, the disappearance of ethereal sulphates in the urine, delayed excretion of salicyluric acid after ingestion of salol, pancreatic colic, and the discovery of maltose in the urine. None of these can be regarded as certain indications, and we might add rapid emaciation and lipuria as indications of the same character. In a number of cases, however, one or more of these symptoms is sufficient to establish a diagnosis of pancreatic disease.

F. Guillou¹ gives a valuable review of the question of glycosuria in primary cancer of the pancreas, noting the earlier opinion that glycosuria was rare with this form of malignant disease; while more recently Miralliè has collected 113 cases of primary cancer of the pancreas, in 50 of which there were records of examination for sugar, with the result that thirteen times glycosuria was present. It has often been noticed that sugar is absent before the fatal issue, and the negative results of many tests are probably due to their having been made very late in the disease, after the glycosuria, previously present, had disappeared. Miralliè, therefore, described two periods of the disease, the first accompanied by comparatively little involvement of the general system, but with slight icterus, some enlargement of the liver, pains, and symptoms of diabetes; the second associated with glycosuria or other symptoms of diabetes, but showing continuous increase of the jaundice, atrophy of the liver, enormous dilatation of the gall-bladder, and a rapidly progressing cachexia. The occurrence of glycosuria in cancer of the pancreas, at least occasionally, cannot be questioned. The quantity of sugar varies; it may be either slight or abundant, commonly fluctuating between 50 and 100 grammes. Polyuria is very frequent, while polydipsia as a marked symptom is rare. Diabetic symptoms have a great tendency to appear very abruptly when dependent upon other diseases of the pancreas, but with cancer they usually appear in obscure form and increase very slowly. As to the actual frequency of glycosuria, in seventy-one cases

¹ Thèse de Paris, 1898.

in which tests were made for sugar, Guillaou has found twenty records of its presence. It is a symptom of importance in the diagnosis of the actual primary disease, because in cancer there is a history of disease of a duration of one year or more, accompanied by glycosuria, and often showing in the advanced stages the disappearance of the sugar.

There are various theories to explain the occurrence of pancreatic diabetes. The condition may be attributed to lack of an internal secretion of the pancreas, which is supposed to control the production of sugar in the liver, while the absence of sugar in the secondary period is attributed to compression of the common bile duct, the resulting icterus so altering the hepatic cells as to prevent the production of sugar in excess. Another theory, that of Thiroloix, attributes the early glycosuria to irritation of the peripancreatic nerves, while with the subsequent destruction of these nerves, the excessive production of sugar ceases. Bard and Pic have put forward still another theory, and divide the cases of cancer of the pancreas into two groups; in one of these there is pre-existing diabetes, in which the cancer causes its disappearance, owing to the supposed increase of the functions of the organ by the excessive hyperplasia. In the other group glycosuria occurs with pancreatic cancer, in their opinion being due to the concomitant sclerosis of the pancreas and of the liver, probably resulting from an infection ascending from the intestine; but since this infection is but occasional the glycosuria is inconstant. Guillaou advances a number of strong arguments against this theory, the most striking of which is based on the cases mentioned by Carnot.¹ In twelve instances of cancer in which glycosuria had been present during life, there were four cases absolutely without sclerosis, seven in which there was but little sclerosis, and only one in which sclerosis was at all marked. The theories as to the causation of the glycosuria itself are three: irritation of the nerve filaments; the destructive action of the cancer, which is supposed to suppress an internal secretion; and the action of a concomitant sclerosis. There is no reason to accept without question any one of these theories.

Diagnosis. Reference will be made later to the tests of the blood and urine in diabetes, but these do not materially aid diagnosis. If the urine of all cases is systematically examined it is scarcely necessary to have any special aids to diagnosis except to distinguish the variety of the disease. R. H. Fitz² regards it difficult to make a diagnosis of pancreatic diabetes, as there are no distinct symptoms. Among 29 cases from the records of the Massachusetts Hospital, in which changes in the pancreas were detected, glycosuria occurred in but 2, and of the 166 cases treated in the same hospital, fatty stools were never recorded.

¹ Thèse de Paris, 1898.

² Yale Medical Journal, March, 1898.

He refers to a case in which the use of raw calf-pancreas seemed to be beneficial. Sometimes it is undoubtedly possible to make the diagnosis of pancreatic diabetes, but in most instances this cannot be done with any certainty.

Jaroussoff¹ reports two cases of diabetes; one apparently caused by disease of the pancreas, the other by a tubercle in the floor of the fourth ventricle. In both cases the fats were digested, but in the pancreatic case, inorganic substances were passed in large amounts in the stools, and he regards this as a point of value in the diagnosis.

Symptoms. The symptoms of diabetes mellitus are so striking that a typical case could not well be overlooked by a careful practitioner. It is well, however, to recognize the fact that there are aberrant cases in which the very conditions ordinarily distinctive are wanting. For the practical physician polyuria and increased specific gravity of the urine are the most obvious signs of the disease, and, with polydipsia, make up the symptoms upon which the diagnosis is usually made. There are cases, however, in which none of these symptoms is present. Thus in a case recorded by J. M. Macphail,² the symptoms were those of diabetes, and there was sugar in the urine and cataracts formed in the eyes, but the specific gravity of the urine was only 1000 and 1010 respectively at two examinations.

I have not observed cases of diabetes with a specific gravity below 1010, but I cannot question the accuracy of Macphail's report, for I have several times treated cases in which the specific gravity was persistently as low as 1015. More frequently than this low specific gravity we observe excretion of small quantities of urine. This condition has been called *diabetes decipiens*. It is certainly not rare by any means. Recently Lenne³ has found, in an investigation of the subject, that it is rather common, making up, perhaps, 25 per cent. of all the cases. That the amount of urine is not increased in these cases he explains by the fact that thirst is not excessive, and he has found that when the thirst increases the amount of urine also increases. These cases do not properly form a special group by themselves, for transformation of ordinary cases into cases of this sort are not unusual.

THE BLOOD IN DIABETES. The study of the blood in diabetes has not thus far given us much of practical value. Not even the scientific or theoretical side of the matter can be regarded as settled. Most authorities, it is true, have believed that cases of true diabetes show an increased quantity of sugar in the blood. Recently, however, Kolisch and von Stejskal⁴ have investigated the amount of sugar in the normal and

¹ Méd. Moderne, 1898, p. 15.

² Indian Medical Gazette, January, 1898.

³ Deutsche med. Wochenschrift, 1898, No. 32.

⁴ Wiener klin. Wochenschrift, 1897, No. 50.

diabetic blood, and point out that jecorin, the substance discovered by Dreschel, which is characterized by its ability to liberate a sugar molecule, is present in the blood and sometimes in a quantity that far exceeds the preformed sugar. The authors examined diabetic blood, and found the preformed sugar in small quantity and jecorin comparatively very abundant. For example, there was 0.15 per cent. of jecorin and 0.02 per cent. of sugar. In another case, 0.06 per cent. of jecorin and 0.025 per cent. of sugar. In a third, 0.13 per cent. of jecorin and 0.017 per cent. of sugar.

They conclude, therefore, that the usual assumption that the glycosuria of diabetes is due to hyperglycæmia, is improper; even in the normal blood, when the comparative estimates were made, they found that the preformed sugar was very scanty as compared with the jecorin. In cases of alimentary glycosuria the conditions are different, for in such the percentage of preformed sugar is high, indeed, higher than that of jecorin. For example, in one case there was 0.053 per cent. of sugar and 0.066 per cent. of jecorin. In a second, 0.16 per cent. of sugar and 0.04 of jecorin. In phloridzin diabetes the amount of sugar is less than that of jecorin, just as it is in normal blood. The authors then refer to their experiments, from which they conclude that the jecorin is not present in a free state in the blood, but combined with albumin. Ordinarily, it is a substance readily soluble in ether, but it is not possible to extract it entirely from the blood with ether, though this can be done after the albumin of the blood is precipitated with alcohol.

It will probably be contended from these observations that the kidneys are the organs which convert the jecorin into glucose and other end products, and another substantiation of Klemperer's renal diabetes will be claimed. Altogether, however, we must see more conclusive work ere these results can be accepted.

As a practical test, Bremer some years since suggested that films of blood be stained with methyl-blue and eosin, when a greenish color of the corpuscles would indicate the existence of glycosuria. This test, if confirmed, would be a useful one, but unfortunately it has not proved satisfactory in the hands of all observers. I myself could not obtain uniform results in any way of practising the test that was suggested.

Löwy¹ has modified the test as follows: He stains the blood two minutes in a 2 per cent. methylene-blue solution, and then ten seconds in a 25 per cent. eosin solution, and he states that whenever the amount of sugar exceeds 2 per cent. this reaction occurs in the blood. He has failed to find the reaction in any case of anæmia. He centrifugated the blood and washed the corpuscles, and still found the reaction present.

¹ Fortschr. de Méd., March, 1898.

TESTS FOR DIABETIC URINE. The same principle has been used by others in studying the blood, and L. Bremer¹ now discusses tests of the urine by a similar method to the above. He points out the different behavior of normal and diabetic urine toward aniline colors. If gentian-violet, finely pulverized, is dropped from a point of a knife on the surface of urine in a test-tube, and the urine kept at the body temperature, the normal urine is refractory to absorbing the violet color, while the diabetic urine becomes blue or bluish-violet in a few seconds. The normal urine becomes weakly reddish-violet, the diabetic urine blue or bluish-violet.

The significance of such a reaction may be great or small, but its value in practical medicine is certainly not very great. Of the same character are the discussions of the chemical relations of the sugar or reducing substances found in the urine.

Le Goff² recalls the fact that there has been a great deal of discussion as to whether the sugar found in the urine of diabetic subjects is really glucose *d*. He has instituted researches concerning this question and finds that there is no doubt that the sugar is commonly glucose *d*; this is, in his mind, unquestionably the sugar that will ordinarily be found, in spite of some recent reports of the presence of pentose, levulose, lactose, etc. The latter substances may, it is true, occur in the urine, but their presence in diabetes is of no consequence compared with the occurrence of glucose.

ACETONURIA. This is still a symptom of great interest, though of doubtful significance. Most authorities have held that it is caused by destructive decomposition of the proteids of the body, and that the degree of destruction depends upon the adequacy or inadequacy of the carbohydrates of the food. It is said by some that the amount of acetone can be controlled at once by administration of carbohydrates. This has not been my experience, though I do not deny the suggested relationship of food and acetonuria.

Recently the view has been expressed that acetone is formed by destructive decomposition of fats, but this wants confirmation.

J. Müller³ has investigated the formation of acetone in the human system. It is known that acetone occurs in very small quantity in the urine of normal persons, and that it is greatly increased in fever, diabetes, starvation, and in various cachexias. As I have said, it is supposed to be produced by breaking down of the proteids of the body, when the diet contains an insufficiency of carbohydrate elements. A moderate grade of acetonuria is produced in healthy persons by a diet absolutely

¹ Centralbl. f. Innere Med., 1898, No. 13.

² Comptes-Rendus de l'Acad. de Science, November 21-23, 1898.

³ Verhandl. des XVI. Congr. f. Innere Med. Wiesbaden, 1898, p. 448.

free of carbohydrates. The only conclusion from this fact is that the carbohydrates either aid in the complete oxidation of the intermediary products of metabolism, or that they hinder the formation of acetone. The author shows that the second mode of action alone need be considered, and he points out that this inhibitive action occurs in the gastrointestinal tract. When carbohydrates are introduced into the body in some other manner, as by subcutaneous injections of sugar water, or feeding by the rectum, there is no effect upon acetonuria. The results of these experiments are not entirely conclusive. The question of absorption of the food is not sufficiently considered.

Swartz¹ has studied the oxidation of acetone and the homologous ketones. In the first place, he studied the excretion of acetone introduced subcutaneously or with the aid of the stomach-tube into the stomach, and the amount of destruction of acetone in the body. He was able to show that only a small percentage is transformed in the body, the amount being smaller in proportion to the increase in the dose administered. When 3.5 grammes per kilo of body-weight were administered, 18 per cent. was eliminated. When the amount was 0.3 grammes to 0.6 grammes per kilo, 60 per cent. was eliminated, and when 0.1 grammes per kilo, 76 per cent. The upper channel of excretion is the lungs, and when very small amounts of acetone are given this is the only mode of excretion. When the dose is from 0.2 grammes to 1.6 grammes, 1 to 4 per cent. escapes in the urine.

Special investigations were made to determine the relationship of acetone elimination to diet. In contradistinction to many observations the author could not determine any relation of starvation, a pure albuminous diet, or an abundant carbohydrate diet to oxidation of acetone. The difficulty of oxidation inside the body led to the investigation of the possibility of causing its oxidation outside. Treating acetone with potassium permanganate at 40°, or with organic extracts at the same temperature, caused only a moderate transformation.

The question of the origin of acetone in the body was also the subject of investigation, but the results were entirely negative. In cases of animals rendered diabetic by administration of phloridzin or by ablation of the pancreas, the transformation of acetone in the body was the same as in normal animals. The possibility that acetone formed within the body might behave differently from that administered, led to the administration of various substances which are related to acetone. Swartz concludes that even the acetone which is formed in the body is difficult to oxidize. Investigations with the ketones homologous with acetone showed that the lower ketones are more difficult to oxidize than the

¹ Archiv f. Exper. Path., vol. xl. p. 168.

higher. The most readily oxidized was diethyl ketone. The method used by the author for determining the quantity of acetone was the iodine method of Messinger.

THE RELATION OF DIGESTION TO DIABETES. The relation of the digestive organs and digestion are of great interest in connection with this symptom (acetonuria) as well as with the subject of alimentary glycosuria. It has often surprised us that in cases of marked diabetes the gastric symptoms are so slight and the gastric function seems so well preserved. Actual studies of the secretions of the stomach have usually showed normal conditions, as in some of the cases of M. Kirikow,¹ who investigated the changes in the gastric juice in five cases of diabetes mellitus. Among the five cases he found almost normal relations in two; sometimes, indeed, a tendency to hyperacidity with increase of the digestive power. In two other rather more advanced cases there was considerable alteration in the secretory activity of the stomach; once, in fact, there was an alkaline reaction of the gastric juice. The pepsin secretion was not totally wanting. In the fifth case there was a tendency to reduced activity of the secretion.

I have already referred to the relationship of hepatic disorders to diabetes, and need not repeat what was then said. The influence of attacks of hepatic colic on the excretion of sugar, as observed by Gilbert and Weil,² is of interest. These authors record their observation of biliary lithiasis in two women the subjects of diabetes. In one patient the excretion of sugar was very great, but after a brief attack of colic the sugar disappeared almost entirely, to return after two days. The second case had colic which was of a mild degree, but was prolonged throughout eight days. During the period of colic there was but a trace of sugar found, while after the termination of the pain there was intense glycosuria. This inhibitory action of hepatic colic seems to be reflex and analogous to the numerous other reflexes sometimes seen during the attacks.

ABSENCE OF KNEE-JERK. Other clinical observations might be cited in proof of the relationship of disturbances of the nervous system to glycosuria. There is a reciprocal relationship—nervous diseases causing diabetes in some cases, and diabetes inducing changes in the nervous system in others. The manner of production of the changes is not always clear. The coma of acetonæmia is quite certainly the result of auto-intoxication, and other nervous conditions doubtless have the same origin. Neuritis is sometimes a result, and a picture suggesting locomotor ataxia may be presented. Even without pronounced symptoms of this kind the knee-jerks may be reduced or wanting. In pronounced

¹ Dissert. St. Petersburg, 1894.

² Bull. de la Soc. Méd. des Hôp., July 22, 1898.

cases there is certainly neuritis; in milder cases there may be only a functional disorder of the nerve cells.

Schupper¹ found the knee-jerks absent in 50 per cent. of the cases of diabetes that he examined, and believes this the result of toxic influence rather than of disease of the nerves or spinal cord. The latter conditions he thinks are occasionally present. R. T. Williamson² also refers to the knee-jerks, and points out that authors differ in their opinions regarding the frequency of disappearance of the reflexes in diabetes. This led him to investigate a series of fifty cases, and, as in his first series of cases, he comes to the conclusion that in 49 to 50 per cent. of the patients Westphal's symptom is present. Most of the cases were severe forms of diabetes. He believes that in private practice, in the mild cases, the percentage would be less. The reflexes frequently disappeared in the later periods of the disease, and toward the end of life they were absent in 73 per cent. of the patients in the hospital. They were wanting in 86 per cent. of the cases in which there was coma. The absence of the knee-jerks was more frequent in youthful persons (that is, under thirty years of age) than in older ones. The author, however, does not believe the absence or presence of the knee-jerks is a sign of prognostic value.

APHASIA. Corneille³ discusses aphasia as a complication of diabetes, pointing out that this has not been generally recognized, though it may occur in the course of well-developed diabetes, or in cases in which the symptoms are latent. Sometimes it has been the first manifestation of the disease. Other nervous symptoms, such as palsy, may accompany it, or the aphasia may be independent. The cause is either a simple disability or disturbance of the centres when the condition is true aphasia and has the characteristics of this affection. The amount of sugar has little connection with the liability to this complication. The prognosis is good, as the complication usually disappears after a time.

R. Laudenheimer⁴ records a case of *senile dementia with glycosuria*, in which increase in the amount of sugar brought on delusions and increased mental depression. He distinguishes two forms of mental disturbance in diabetic persons: the apathetic and the irritable.

Treatment. The number of remedies that have been recommended for the treatment of diabetes would include almost the entire *Pharmacopœia*, and each year brings out new suggestions. The praise of authors must be taken with great reservation, especially when, as is so commonly the case, no consideration is given to the variety, severity, or clinical course of the individual case. On the other hand, there is a tendency

¹ Soc. Lancisiana Roma, January 24, 1898.

² Lancet, July 17, 1897.

⁴ Berlin. klin. Wochenschrift, June 6, 1898.

³ Thèse de Paris, 1898.

among certain authors to let their notions of the pathology of the disease govern their therapeutic endeavors too largely. Thus there are some who expect to see results from the administration of pancreatic extract, liver extract, etc., in selected cases, and if these remedies do not cause improvement the authors conclude that the disease is not pancreatic or hepatic in origin. The treatment in such cases is as groundless as the final assumption. It is possible for disordered hepatic or pancreatic function to produce forms of diabetes which, however, might be uninfluenced by administrations of extracts of liver or pancreas. Reference may be made to the contribution of F. Lamoreux,¹ who notes that extract of liver seems to cause an increase in the functions of the liver and an improvement in the general nutrition of the individual. He believes that hepatic organotherapy in diabetes causes a marked diminution in the amount of sugar, or its complete disappearance, and that it always causes a decrease in the evidences of hepatic insufficiency, such as urobilinuria and indicanuria, while the excretion of uric acid and of urea is increased. The action upon the excretion of urine is variable, but in most cases it decreases the polyuria. The general health is said to improve even in those cases in which the glycosuria does not diminish, and he states that the action is prolonged for some time after cessation of the treatment. He believes that organotherapy is particularly valuable in those moderate cases of arthritic diabetes in which the amount of sugar excreted is not above 100 grammes daily. The extract of liver is said to be readily taken by the patients in doses of 12 grammes a day, and may be administered for a long time without producing any toxic symptoms. He believes that it is best to administer it per rectum. These statements must be received with very great caution, and though we may not properly discard them as fanciful, we cannot accept them without substantial confirmation. There are no facts as yet to prove that the liver is largely concerned in the matter of internal secretion.

The fundamental basis of treatment of every case of diabetes must be a careful study of the nature of the individual case. In the second place, diet, general hygiene, exercise, etc., need attention. Finally, drugs may be considered. It is rarely that treatment is instituted in this way; as a rule, a fixed diet (so-called diabetic diet) is ordered, and some remedy that has been recommended is given. Fortunately, however, the profession has begun to realize in a practical way that the treatment must vary to meet the peculiarities of the individual case.

R. Lepine² reviews critically the various medicinal and physical agents used in the treatment of diabetes mellitus. As excitants of glycolysis he mentions oxygen, iodoform, and lactic acid. He says that in diabetes

¹ Thèse de Paris, 1897-98.

² La Semaine Méd., December 14, 1898.

associated with obesity he has used permanganate of potassium with good effects, and suggests that binoxide of manganese be used for this purpose since it is easy to administer and may be taken with impunity in large doses; Roux has noted the readiness with which it will yield its oxygen. It may be objected, however, that proof is still wanting that oxidation is deficient in obesity. Alkalies seem to Lepine to be of some value in exciting glycolysis, and of ferments, yeast has been found of some value, though it is apt to disturb the digestion. Lepine believes the soluble ferment is most readily borne. Muscular exercise increases glycolysis, and is not sufficiently often advised for this purpose, though it must be used with a great deal of care, since diabetics are so readily prostrated. Electricity seems to have given some good results, as has the use of thyroid extract, but it is certain that in many cases the rapidly interrupted current does harm, and that in practically all cases thyroid treatment does harm.

Among medicines which decrease glycogenesis Lepine speaks very highly of antipyrin. Opium is usually the most satisfactory for this purpose, but he occasionally finds cases which will not yield to it and do improve on antipyrin. He states that he has no hesitation in asserting that neither of these drugs ever cures the disease; they act purely symptomatically. The bromides are of little value, but he believes that jambul does restrict glycogenesis. Arsenic cannot be considered as essentially an antidiabetic drug, but it acts well upon the general nutrition, and so often does good. He expresses no personal opinion upon the value of nitrate of uranium. He gives a series of abstracts of reports of treatment with pancreas, and states his belief that pancreas has a favorable action upon glycolysis. He believes that the great reason for negative results after the administration of this gland is to be found in the fact that it contains very little ferment, discharging it nearly as rapidly as it is produced; he insists that large quantities will often have a favorable effect, and states that examination of previous reports shows that when large doses were used the results were much more favorable than those from smaller doses. There have been some apparently favorable clinical and experimental results from hepatic organotherapy.

It is difficult from such a multitude of suggestions to draw any useful conclusions as to the method of treatment suitable for a certain case. It is by no means clear, though we may incline to believe it so, that certain remedies reduce the formation of sugar, and others increase the elimination. Any practical plan of treatment based on such assumptions will have no great likelihood of success.

More or less exercise is undoubtedly very necessary in diabetes, and I agree with the conclusions of Hirschfeld,¹ though I cannot accept all

¹ Berlin. klin. Wochenschrift, 1898, No. 10.

of his views. This author, in an investigation of the relationship between obesity and diabetes, asserts from numerous observations that persons who are fat, or at least well nourished, and who take but little exercise, develop alimentary glycosuria under the influence of a diet rich in carbohydrates, whereas after a successful treatment for the obesity, with abundant exercise, this was no longer true. Probably in some instances, for example in cases of traumatic neuroses, the comparatively frequent occurrence of alimentary glycosuria is less dependent upon the diseases than upon the inability to take exercise in association with abundant nourishment. The fact that the milder forms of diabetes are less common among persons who are engaged in work requiring physical exertion and who do not indulge in dietary excess, is a further evidence of a relationship between insufficient muscular exertion and diabetes. In case of a disposition to diabetes, it would, therefore, be advisable to regulate the life according to these ideas. The use of an abundant diet over a considerable period of time is justified in severe cases of diabetes only to obviate the danger of failing nutrition; in the milder cases, it is permissible at times to overcome the results of some complication. Too long-continued overfeeding may lead to dangerous complications, as arterio-sclerosis and apoplexy.

Jardet and Nivière¹ have treated a number of cases of diabetes by instituting exercises of the upper extremities in order to increase respiration, and by using massage of the salivary glands and instructing the patients to masticate their food with especial thoroughness. The results were good in all cases reported, and in some they thought they had accomplished a cure. They note that buccal affections are common in arthritic subjects, and they believe that this affection, leading to decrease of salivary secretion, interferes with proper digestion of starches and is the cause of the diabetes which is so common in such subjects. Conjugal diabetes they would explain by the suggestion that these chronic buccal affections are communicated from husband to wife, or *vice versa*. This theory is fantastic in that it does not recognize that diabetes is at least in greater part not a disease of digestion, but of metabolism. Were the absence of salivary secretion an important cause of diabetes, the subjects of xerostomia would be especially subject to the disease, but they are not.

The dietetic management of diabetes is, as I have said, too often conducted in a routine way without regard to the nature of the case. Fortunately, the attempt to put the patient on a "diabetic diet"—that is, a diet of pure proteids and fats, usually fails, because the patient gets more or less carbohydrates with his prescribed foods, or surreptitiously. If such a pure diet could be enforced in every case, it is probable that more patients would be harmed than helped.

¹ Revue de Médecin, December 10, 1898.

R. Lepine¹ reviews the various questions in relation to the dietetic treatment of diabetes. He first insists that exclusive proteid diet is dangerous and is often likely to increase the amount of sugar excreted instead of preventing its loss. As to the use of fats, it is generally stated that diabetic patients should be allowed to take these in as large quantities as they can digest without distress. Lepine reports, however, that in administering cream to a diabetic patient he noticed that the excretion of sugar was increased considerably beyond the amount proportionate to the carbohydrates contained in the cream, and he thinks it probable that some of the fat was converted into carbohydrates, though, of course, this is not proved by such an observation. It emphasizes, however, the necessity for observing the action of fats upon the sugar excretion. He does not believe in absolutely forbidding the use of carbohydrates, but he does insist that sometimes very narrow restriction of the use of these substances, for a considerable period, will result in decreasing the excretion of sugar for some time after the patient has resumed the use of carbohydrates in the diet. Bread is, he believes, the best of those to be used. He holds that fruits are looked upon with too much fear by physicians, and notes that oranges and apricots, for instance, contain so little sugar that it is of no importance; he also directs attention to the fact that in most fruits much of the sugar is levulose, and this is more thoroughly assimilated by diabetics than is glucose. If the patients desire that their food be sweetened, he believes that this can be done by the use of saccharin without any serious effects, since he has been unable to observe the marked disturbance of digestion and other unfavorable symptoms which others have reported as ensuing upon the use of this substance. In using milk one must study the idiosyncrasies of the patients, some of them taking it fairly well, and others doing badly upon it; milks which have been deprived of their sugar by fermentation, such as koumyss or kephyr, are often valuable in diabetics, and it should be a general rule that patients should be allowed to drink freely of substances that contain no sugar but are distinctly diuretic.

The question of administering alcohol does not interest American physicians as greatly as their European colleagues, as wines and beer are not so habitually used. When there seems to be a need of stimulus we do not hesitate to prescribe dilute whiskey or wine. Lepine² states that sugary wines and liquors are to be absolutely forbidden; beer is next in the list in point of harmfulness, then follows cider which is usually distinctly bad; there are a number of white wines which seem to increase sugar excretion. Some of the red wines are distinctly harmful, while others are less so, and of all wines it may be said they are dangerous

¹ *La Semaine Médicale*, (October 5, 1898.

² *Loc. cit.*

for most diabetics if they are taken in considerable quantity. Alcohol of itself, however, if taken in small quantities, is stimulating, and aids digestion without increasing the glycosuria. Lepine finds that pure alcohol, largely diluted with water, oftentimes causes improvement in the symptoms.

Among many remedies recommended for the treatment of diabetes, we may refer to the following :

Jaccoud¹ regards arsenous acid in doses up to one-eighth of a grain per day as most useful. When this is not well borne he uses extract of thebaia, giving six or seven grains per day, and combining with this the administration of oxygen.

C. H. Bond² and Daniels³ speak highly of the use of uranium nitrate in glycosuria and diabetes mellitus. One of Bond's cases of diabetes seemed to be practically cured after the use of this drug ; three other cases were improved, and five cases of glycosuria without distinctive symptoms of diabetes all improved, while three seemed practically well.

A. Meyer⁴ uses mercuric chloride in the treatment of diabetes, and claims good results. This drug is administered, he states, because of his belief that it exerts a specific action upon a supposititious ptomain or bacterium, which he believes causes the disease.

Estay⁵ reports two cases of diabetes treated with methylene-blue with successful results.

THE TREATMENT OF DIABETIC COMA. The treatment of diabetic coma by saline transfusion has in my experience given brilliant temporary results in several cases, but I have never observed so striking an effect as the following one of T. Oliver,⁶ who records a case of diabetic coma in which saline transfusion caused a clearing up of the intellect, and this satisfactory condition was still present four weeks after the operation. The patient, a man aged thirty years, was admitted to the hospital January 25, 1898, with a history of diabetes of at least eight months' duration. He would frequently drink large quantities of liquid in the evening, and get up during the night to quench his thirst. He began to lose strength, was constipated, the amount of urine increased greatly, and he lost weight. Diabetic diet and codeine were ordered, and he was making fair progress when on July 12th he left the hospital to go to his home at some distance. He was brought back the same evening in coma. Transfusion with saline solutions was at once ordered, the patient receiving two and one-half pints, and free purgation was instituted at the same time. The patient's mind began to clear and he complained of pain. The urine was not carefully examined just before

¹ Méd. Moderne, 1898, No. 14.

³ Northwestern Lancet, March, 1898.

⁵ Méd. Moderne, January 27, 1898.

² Practitioner, September, 1898.

⁴ Medical Record, December 10, 1898.

⁶ Lancet, August 13, 1898.

and after the transfusion, but later it was found to be free from albumin and acetone, although it contained sugar. The amount was small at first, but soon increased so that the original large quantities were regained.

The interesting feature of the case before alluded to was that consciousness was restored and retained for four weeks. At the end of that time the patient left the hospital. I have seen the intellect grow clearer and even quite clear for some hours, but invariably the patient has relapsed into unconsciousness. It may be asked, however, if the treatment is not often delayed until it is too late.

My own experience has sometimes been much like that of Besson,¹ whose patient suffering from diabetic coma, with daily excretion of from 600 to 800 grammes of sugar for five or six days, with rapid pulse and marked asthenia, suddenly became comatose. She was cold, showed no reflexes, the pulse could not be felt, and the lack of respiratory movement indicated that she was dead. Besson injected a solution containing 25 grammes of bicarbonate of soda, and one hour later the patient recovered consciousness. Death occurred, however, the following morning.

Roget and Balxay² injected a 0.7 per cent. solution of sodium chloride in a case of coma. At first 1 litre was given into the median cephalic vein; this caused slight improvement of the pulse, and further injections were undertaken. In six days 8.5 litres were injected, 2 litres directly into veins and the remainder into the subcutaneous tissues. The first effect of this was to cause a great increase in the amount of urine secreted; subsequently there was a gradual decrease of the coma, with final recovery of the patient's normal mental condition. About four months afterward the patient died of a purulent pleurisy after presenting signs of cavity formation in each lung. The authors note especially that even upon microscopical examination the kidneys appeared entirely healthy, and to their ability to excrete poisons, and thus to respond to the purpose of the transfusions, they attribute the happy effect of these injections. The pancreas was found somewhat atrophied.

R. Lepine³ records the history of a case of diabetes which seemed in imminent danger of becoming comatose. The intravenous injection of 2 litres of sterilized water containing 20 grammes of bicarbonate of soda, caused the secretion of almost 6 litres of urine within twenty-four hours, and a fall of the pulse from 108 to 68, while the general condition became very greatly improved, the dyspnœa vanished, and the appetite returned. During the injection it was noticed that there was gallop rhythm, which stopped at once after the suspension of the injection. This was due to too rapid introduction of the fluid into the circulation.

¹ *Gaz. Hebdom. de Méd. et de Chir.*, September 29, 1898, p. 929.

² *Loc. cit.*

³ *Lyon Médicale*, July 31, 1898.

GLYCOSURIA.

Definition and Etiology. I have discussed the definition of glycosuria under the head of diabetes, and will not repeat it here, therefore. In some cases it is easy to establish a diagnosis, as in cases in which the temporary presence of glucose in the urine is due to some definite transient cause and disappears with removal of the cause. When the symptom is at all persistent, however, the diagnosis must always incline to diabetes, unless there be distinct reasons for calling the case merely glycosuria. Quasi-physiological forms are recognized, as, for instance, the glycosuria of the puerperium. The frequency of this has been variously estimated by different observers. Recently Brocard,¹ in examining 125 pregnant women, noted glycosuria in sixty instances, or in nearly 50 per cent. This is not the absolute percentage, however, since the presence of sugar depended largely upon the diet, time of micturition, and other factors. The sugars commonly found were glucose and lactose, more rarely saccharose and levulose. Brocard also determined that alimentary glycosuria occurred in a considerable number of these cases after taking only 50 to 100 grammes of glucose. This was seen in women who presented no signs of any disease or functional changes in the liver, and must, in his opinion, be attributed to some general nutritive disturbance. Charrin, in a discussion of this paper, suggested that the cause of this alimentary glycosuria was possibly to be found in the excess of fatty tissue present in the livers of pregnant women, for fatty liver tends to produce alimentary glycosuria. It is rather difficult to determine the cause of this glycosuria of puerperal women, but the weight of evidence points to the state of general nutrition as the principal factor.

The relationship of diet to glycosuria in the puerperium and in other conditions has received much attention, and it is clear that excess of carbohydrates causes the appearance of sugar more or less abundantly in different conditions. Even in health diet may bring on a temporary glycosuria. Thus L. Breul,² in an investigation in which he operated upon himself to determine the existence of sugar in the normal urine as a consequence of dietary changes, found glycosuria easily induced. He used the method of Laves for the quantitative estimation of sugar by means of phenyl-hydrazin, having first determined by control examinations that the method is accurate when sugar is present in the proportion of 0.1 to 100 of liquid, recovering 97 to 100 per cent. of the sugar in this case. When the quantity is 0.05, 85 per cent. is recover-

¹ *Comptes-Rendus de Biol.*, December 3, 1898.

² *Archiv f. Exper. Pathol.*, vol. xl.

able, and when it is 0.02, 65 per cent. The urine was precipitated with lead acetate, the filtrate freed of the lead, and 50 c.cm. of it brought to a boiling temperature with 2 grammes of phenyl-hydrazin and 3 c.cm. of glacial acetic acid during one and one-half hours. The precipitate of phenyl-glycosazon was filtered and weighed. During the period in which he took a carbohydrate diet or a purely meat diet, he found a daily excretion of from 0.36 to 1.95 grammes of sugar, the percentage being on the average 0.05 to 0.06. When he fasted, no sugar was discoverable, but it immediately reappeared when food was taken. The physiological glycosuria was most marked when muscular exercise and heat radiation were restricted.

The question of the relation of diet to glycosuria in various diseased conditions may involve other considerations than those which present themselves in normal individuals. In particular it has been a matter of interest to determine the influence of nervous disorders upon the ease of development of glycosuria. There is, no doubt, some relationship between certain nervous diseases and diabetes, and certainly alimentary glycosuria is more frequent in such cases than in those in normal health. Thus Van Oordt,¹ in a study of the relations of alimentary glycosuria to nervous diseases, found positive results in 12 of 75 cases of organic disease of the central nervous system, and 13 positive results among 103 cases of functional diseases. In the former group of 12 there were 5 cases of tumor of the brain—1 in the cerebellum, 2 in the cerebrum, and 2 in the pons. The relationship of organic diseases of the brain is also shown by M. Loeb,² who directs attention to his early statement that there is a relation between tumors of the pituitary body, glycosuria, and elevation of temperature. Such a relation he claims to have described before akromegaly was known, and the relation was attributed by him to the effects of pressure upon neighboring structures rather than to any change in the possible function of the gland itself. He especially insists that tumors of the hypophysis cause glycosuria by pressure, this being especially evident in certain reports in which intracranial tumors, varying in size, from time to time produced intermittent glycosuria.

M. Arndt,³ in studying the frequency of alimentary glycosuria in neurasthenics and in those the subjects of other functional disorders of the nervous system, examined 96 cases. In 31 who were the subjects of hysteria there were 2 instances of alimentary glycosuria. In 7 hypochondriacs it was never present, but was seen 5 times in 21 cases of melancholia, once in 7 cases of stupor, once in 6 maniacs, never in 13 epileptics, while 4 cases of traumatic neuroses showed it in every

¹ Münch. med. Wochenschrift, January 4, 1898.

² Centralbl. f. innere Med., September 3, 1898.

³ Berlin. klin. Wochenschrift, December 5, 1898.

instance. Cases of hysteria, hypochondriasis, and neurasthenia not due to trauma, showed alimentary glycosuria in 14.4 per cent. of all cases, while in the traumatic neuroses it was present in 32.6 per cent., so that the traumatic cases seem to show a special tendency to alimentary glycosuria.

Some light is thrown upon the relation of the gastro-intestinal tract to temporary glycosuria by investigations of the effect of subcutaneous injections of various carbohydrates. Thus C. Achard and E. Weill¹ have investigated the diuretic effect of doses of 100 to 150 grammes of saccharose, invert sugar, glucose, and lactose. Subcutaneous injection of these various forms of sugar, as well as ingestion by the mouth, produced polyuria very readily, the subcutaneous use acting with especially marked readiness. As little as 1.5 grammes of saccharose, for instance, caused an appreciable increase in the amount of urine, and with small doses of sterilized solutions of sugar, used subcutaneously, it was possible to cause a marked increase in the secretion of urine in patients with oliguria. With the increase in the amount of urine there was often noticed an azoturia and a considerable increase in the other elements. It was noted that not infrequently, beside producing a glycosuria, the injections caused urobilinuria and indicanuria. These conditions were but transitory, appearing some hours after the absorption of the sugar, and were probably due to the excessive demand upon the liver as a result of the large doses of sugar. These results were observed much more frequently in those who were ready subjects of alimentary glycosuria than in others.

Whether the ready development of glycosuria by subcutaneous injection points to glycolytic insufficiency, as the authors contend, is still a matter of uncertainty. It may be that the glycosuria results only because the unaltered saccharine material is introduced into the bloodstream, while in administration by the mouth this may be prevented by the gastro-intestinal tract. In some cases, however, they found that levulose injected subcutaneously appeared in the urine only in traces, as was the case in healthy individuals, and they believe, therefore, that the levulolytic power of the blood is not distinctly different from what it is in health. The same was true in their experiments to determine the galactolytic power of the blood. All of these attempts to show a distinct glycolytic or saccharolytic power, and to suggest a ferment with this power in the blood, require further investigation, attractive as the theories appear. It is interesting in connection with this question, however, to refer to some investigations of the development of glycosuria by the administration of phloridzin. This substance, as is well known, is a

¹ Bulletin de la Soc. Méd. des Hôpitaux, July 22, 1898.

glucoside which readily yields a certain amount of glucose, and which produces in animals a glycosuria when administered in certain quantities. In some investigations the amount of sugar in the blood was found to be no greater than normal, though the excessive excretion of glucose had suggested the existence of hyperglycæmia. Other investigators have not obtained the same results, and the whole matter needs final solution, despite the number of studies already recorded.

Lusk,¹ with the assistance of others, has investigated the relation of phloridzin diabetes to the administration of various forms of sugar and gelatin. When rabbits received 2 grammes of phloridzin subcutaneously, the excretion of sugar lasted from seven to twenty hours. When 1 to 2 grammes were administered, three times a day, a continuous excretion of sugar was noted, and after the second day the relation of the sugar to the nitrogen in the urine was as 2.8 to 1, and remained so almost constantly. From this it may be determined how much sugar is derived from albumin. It would seem that 100 grammes of albumin produced 45.08 grammes of dextrose. When dextrose is administered beside the phloridzin the albuminous destruction decreases while the sugar in the urine increases. All of the sugar given to the animal is not excreted as sugar, since the animal has not lost its power of consuming sugar. When levulose is fed the amount of dextrose in the urine increases, amounting to from 17 to 20 per cent. of the levulose, and this is explained by the assumption that glycogen is made out of levulose in the body, and subsequently converted into dextrose. Milk sugar also increases the excretion of dextrose to the extent of 7 to 12 per cent. of the lactose. When gelatin was given beside the phloridzin, the nitrogenous excretion was increased, and the amount of dextrose also, from which the author concludes that sugar may be produced in the body from gelatin. It is evident from these experiments that phloridzin, beside causing direct glycosuria, aids in producing still greater excretion of glucose by hastening the excretion of the carbohydrates of the food.

A similar action was claimed for thyroid extract by Bettmann, but in a more recent investigation of the question, S. Mawin² arrived at results similar to those of Strauss and Goldschmidt, who showed that glycosuria is not favored by administration of thyroid extract. Mawin found in twenty-five persons, in whom a preliminary test showed no glycosuria after glucose was eaten, that only two had glycosuria when thyroid extract was given for eight days previously. It is apparent, therefore that his results do not substantiate the views of Bettmann. He believes that some disposition to the glycosuria must exist or the thyroid will not act.

¹ *Zeitschr. f. Biol.*, xxxvi., S. 82.

² *Berlin. klin. Wochenschrift*, December 27, 1897.

THE LIVER AND GLYCOSURIA. There is a general and more or less well-founded belief that the liver bears some relationship to glycosuria and diabetes, and the subject has been discussed in another place (see Diabetes). For the present we may refer to some of the experimental and clinical reports that have recently appeared, which serve to show the difficulty of arriving at a definite decision regarding the whole question.

H. Strauss¹ has carried on clinical and experimental studies concerning the relation of the liver to glycosuria. In thirty-eight instances of disease of the liver he attempted to produce alimentary glycosuria by administering 100 grammes of glucose in 500 c.c. of water, the mixture being given on an empty stomach. But two cases showed glycosuria and both of these had suffered from trauma in the region of the liver. Frogs were experimented upon by removing the liver and administering glucose, and it was found that they were able to take as much glucose as did normal frogs. He decides from these results that the liver is of little importance in preventing glycosuria after the introduction of carbohydrates. Changes in the liver are not by any means constant in diabetes, and in many instances are accidental or due to some cause which produced the diabetes, or are the consequence of the diabetes. It seems fairly certain that disease of the liver alone never produces diabetes mellitus, but that it is necessary to have some other disturbances in order to cause the disease. In the two cases of hepatic trauma which showed alimentary glycosuria, it seemed probable that the nervous shock might have been quite as important as the local injury to the liver.

Results pointing in the same direction were obtained by Zinn,² who discusses the question of glycosuria in cholelithiasis, and notes the varying results which different observers have obtained. He records his own observations in eighty-nine cases, in but two of which sugar was found. In both of these cases sugar was present for but a brief time. From these results and from those of a number of others, especially of Naunyn, whose examinations of 250 cases were entirely negative, Zinn decides that glycosuria is uncommon with gallstone colic.

On the other hand, A. Exner³ has examined the urine in forty cases of cholelithiasis, and in all of these, with one exception, sugar was present, the amount usually being about 4 per cent. He believes that this is a matter of importance in diagnosing the presence of gallstones. It was impossible to determine whether the presence of sugar was dependent upon the lodgement of the stone in the cystic duct or in the common bile-duct.

¹ Berlin. klin. Wochenschrift, December 19, 1898.

² Centralbl. f. innere Med., September 24, 1898.

³ Deutsche med. Wochenschrift, August 4, 1898.

The fact that stones were present was proved by subsequent operation, and after their removal the sugar disappeared.

In comparing the results of different clinicians care must be taken to scrutinize the methods of examination employed. Certainly the wide discrepancies just pointed out must be due to some error in methods. The general impression that disorder of the liver is of importance in the etiology of glycosuria is based upon considerable clinical and pathological evidence, and cannot be removed by anything but the most convincing disproofs. A clinical and pathological contribution of passing interest in this connection is that of M. Laub,¹ who reports three cases of phosphorous poisoning, in all of which careful chemical studies were made, and in two of which sugar was present in the urine. The first patient, a girl of seventeen years, exhibited symptoms of severe poisoning, with enlargement and tenderness of the liver, hemorrhages, repeated vomiting, and jaundice. On the third day sugar was found in the urine, but it disappeared in two days, and remained absent until the tenth day, when a trace reappeared. She recovered, and subsequently it was found that alimentary glycosuria could be easily induced. The second case was that of a man who had milder symptoms, in whose urine sugar was found on the seventh and eighth days. The author suggests that this glycosuria is due to insufficient storage power on the part of the liver and resulting hyperglycæmia. While this opinion is naturally suggested by what is known of the physiology of the liver, actual proofs are still wanting. An indirect investigation of the rôle played by the liver was made by P. F. Richter,² who produced glycosuria by means of caffeine preparations in order to study the action of certain drugs which reduce glycosuria. Glycerin had no effect of consequence upon the glycosuria produced by diuretin, and it was evident, therefore, that glycerin did not control the saccharification of the glycogen of the liver. Glycerin itself, however, evidently produced glycogen, since its administration with diuretin caused sugar to appear in the urine. The administration of carbohydrates with the subsequent injection of diuretin did not produce glycosuria, however, if opium were given, except when carbohydrates were given in excessive amounts or when the animals had been previously starved. It was evident, therefore, that opium controlled the glycosuria, probably by preventing saccharification of the glycogen of the liver. The latter was proved to be true by estimating the amount of glycogen in the liver after the administration of the diuretin, both alone and with opium. In the first case it was found greatly reduced, but in the latter case large quantities of glycogen were found. This seems to prove, therefore, that opium does limit the sugar formation in the liver. Antipyrin had much

¹ Wiener klin. Wochenschrift, January 13, 1898.

² Zeitschr. f. klin. Med., Band xxxvi., Heft 1 and 2.

the same effect, though it was less marked. This drug also seemed to decrease the diastatic effect of the blood. Alkalies had no notable effect upon the diuretin glycosuria; investigation of *syzygium jambolanum* showed it to be entirely without influence upon this glycosuria, and, therefore, it does not seem likely to be useful in diabetes. These investigations are interesting, but though apparently convincing in some directions, want confirmation.

Methods of Examining the Urine. PHENYLHYDRAZIN TEST. R. T. Williamson¹ describes his own method of carrying out the phenylhydrazin test for sugar in the urine. He pours phenylhydrazin hydrochlorate powder into a test-tube until the latter is filled to about one-half inch, and a similar amount of potassium acetate is added; then the test-tube is half-filled with urine, heated to the boiling-point, kept boiling for two minutes, then placed aside for about half an hour, and the deposit examined microscopically for the characteristic crystals. Williamson's method of examining for slight amounts of sugar is to first try Fehling's solution. If this is negative he tries the phenylhydrazin test, and if the latter is positive the fermentation test, since phenylhydrazin may give reaction in rare cases when glucose is absent. He carries out the fermentation test by placing the normal urine in one tube, the suspected urine in another, yeast being added to both; after twenty-four hours they are tested again by Fehling's solution. If the suspected urine had previously caused some reduction of Fehling's solution, and now none appears, and if it shows greater evidence of fermentation than the normal urine, some sugar has been present.

FRÖHLICH'S METHYLENE-BLUE METHOD. A. Fröhlich² advocates the following method for demonstrating grape sugar in the urine with methylene-blue: Five c.c. of concentrated solution of subacetate of lead and 5 c.c. of acetate of lead are first added to precipitate the urine. Then equal parts of the filtrate and of concentrated methylene-blue solution (1:300) are mixed, with the addition of potassium hydroxide solution, and boiled. Discoloration, under these circumstances, shows the presence of sugar. The lowest percentages in which he could demonstrate sugar with this test were 0.04 to 0.05 per cent. Among the substances present in the normal urine, which may act in a similar way, are the coloring matters and possibly also glycouronic acid; uric acid and creatinin do not react.

LEHMANN'S METHOD FOR QUANTITATIVE ESTIMATION. Benjamin³ has investigated the clinical value of Lehmann's method for the quantitative estimation of sugar in the urine. The method consists in mixing a known quantity of Fehling's solution with an accurately measured

¹ Practitioner, December, 1898.

² Centralbl. f. innere Med., 1898, No. 4.

³ Deutsche med. Wochenschrift, August 25, 1898.

quantity of urine. This mixture is then boiled and filtered, the filtrate diluted, and to an accurately measured portion of the filtrate sulphuric acid is added; to this potassium iodide is now added, the result being that iodine is set free, and the amount of free iodine is determined by titrating with a one-tenth normal solution of sodium hyposulphite; the reaction is considered complete when the brown color of the solution has disappeared. Benjamin first experimented with known solutions of copper sulphate, and found that the results by Lehmann's method were almost the same as those obtained by gravimetric methods. Later, known solutions of sugar were tested with entirely satisfactory results, and, finally, specimens of diabetic urine were analyzed by both methods, with differences never amounting to as much as 2 mg. in 5 c.c. of urine. He decides, therefore, that this method, which is very rapid, is entirely satisfactory for clinical purposes.

DIABETES INSIPIDUS.

It seems not unlikely that various conditions have been grouped under the heading diabetes insipidus, some cases, no doubt, being symptomatic of intracranial disease, others unassociated with cerebral or other nervous disease. The basis of differentiation of such varieties, however, remains to be established. There is certainly a marked contrast between the effect upon the general health in some cases and the lack of symptoms in others.

At best the disease is one of great obscurity. Its occasional association with certain disorders of the nervous system cannot be denied, but in some instances it is apparently related to diseased conditions of other parts, such, for example, as abdominal tumors. Pathologists have been interested to know whether the increased excretion of urine was due to the fact that the kidneys became more permeable, and therefore allowed a larger quantity of water to filter through, or to the fact that there is actually increased glandular activity. Again, it is of interest to determine whether the thirst is primary or secondary. The subject is so thoroughly reviewed by Strubell¹ that I refer to his investigations for a satisfactory exposition. He reports two cases of diabetes insipidus, with some very interesting studies directed mainly to the determination of the relationship between the polyuria and polydipsia, and begins by pointing out that this question of relationship has occupied the attention of authors from the beginning, though no satisfactory explanation has yet been reached. Lacombe, Baudin, Magnant, Rhomberg, Nothnagel, and Buttersack, are mentioned among those who hold that the increase

¹ Deutsche Archiv. f. klin. Med., 1898.

of thirst precedes the polyuria, but, as Strubell points out, they are in the minority in holding this view. A case of Nothnagel is cited, which has frequently been referred to by authors. A man, thirty-five years old, after being kicked upon the abdomen by a horse, fell backward upon the ground, his head, in the region of the right ear, striking a piece of wood. He was not rendered unconscious, though stunned. After a little while, at the most one-half hour, he experienced great thirst and drank freely of water. He was brought to the hospital in three hours, and during the transportation passed urine freely. Nothnagel regarded the case as one of primary polydipsia, on account of the early appearance of this symptom, but Strubell cites the case in the beginning of his paper, and, in referring to it again at the end, very properly states that although the polydipsia was the first symptom noticed by the patient, this may have been secondary to increased secretion of urine which the patient was unaware of on account of a capacious bladder.

The author next refers to some investigations that have been made to determine whether or not there is increased rapidity in the excretion of water in patients suffering from this disease. Neuschler¹ referred to experiments performed by himself, and also quoted from Falk² and from Neusser;³ Kraus⁴ made experiments in the same direction. Neuschler concludes that in his case it was impossible to believe that any abnormal increase of activity on the part of the kidney could explain the peculiarities. He found that immediately after the ingestion of large quantities of water the diabetic patient passes less than healthy people, and he concludes from this that the diabetic has slower absorption from the gastro-intestinal tract than the healthy person, which he regards as a characteristic symptom of the disease. Kraus opposes the view of Falk regarding the slower absorption of water, and points out certain fallacies in Neuschler's experiments. He attacks the belief that the patient with polyuria, after withdrawal of water, passes for a long time large quantities of urine, though this diminishes regularly, and doubts also that this excreted liquid is drawn from the tissues. These statements of Neuschler and others, Kraus holds are doubtful, and he shows that such a condition could not possibly be borne by a patient for any length of time; he points out also that one of Neuschler's patients, a boy, passed in one day, during which he was given very little water, half as much liquid as the entire amount of blood in the body. He refers to Geigel, who has found that patients bear without great danger a diminution in the amount of water, but do not pass more urine than they have taken in liquid. He believes that the cases reported in the literature, in which there was an overplus of excretion, are cases in which, owing to insuffi-

¹ Dissertation Tübingen, 1861.

³ Dissertation Tübingen, 1856.

² Deutsche klinik., 1853.

⁴ Zeitschr. f. Heilk., 1887.

cient care in the experiment, the patient under observation has not excreted the water taken previously to the experiment. He, himself, made investigations in diabetic persons and control examinations in healthy persons. In each case three litres of water were given in the course of an hour, or for five hours one-half litre hourly. The amount of urine in the diabetic patient was found to be exactly the reverse of what Neuschler had stated, Kraus finding, on the contrary, that the curve in the diabetic patient ran in advance of that of the healthy person, but rapidly declined, whereas in the healthy person there is a slower increase and a longer retention of the marked polyuria.

Referring now to Strubell's cases : Case I., a man of twenty-six years, a tanner by occupation, presented himself with a history of increased urination during a period of one and one-half years. The disease began gradually without any apparent cause. All the organs were normal and the skin dry. The amount of water drunk and the amount of urine passed were equal. There was neither albumin nor sugar in the urine, and the specific gravity varied from 1000 to 1003. The capacity of the bladder was at least 1600 c.c. A number of investigations were made and control examinations were instituted in healthy persons. It was found that in the patient suffering from diabetes insipidus, abstinence from water for a number of hours was badly borne. (The patient almost suffered relapse.) The administration of water at this time, however, was followed by no very rapid excretion ; while in the control person, the hour following the administration of water, after abstinence, was marked by comparatively excessive excretion, though the amount soon fell to normal, whereas in the diabetic the amount only gradually subsided. After abstinence for several hours, the quantity of dry residue in the blood of the diabetic patients increased 1 to 3 per cent. ; whereas during his ordinary condition, the quantity of water and quantity of dry residue in the blood were normal. The specific gravity of the blood varied in conformity with the amount of residue. The examination of the nitrogen metabolism showed that there was retention of nitrogen, though it was practically normal. It increases and decreases with increase and decrease of the amount of water taken. The insensible perspiration is decreased comparatively more than absolutely, but is variable. Inosite was not found in the urine. Increase of temperature caused a decrease in the thirst and in the excretion of water temporarily, but had no permanent effect.

The second case was a young man with a history of considerable thirst, who had passed large quantities of urine from early childhood. When he came under observation he passed from 6000 to 10,000 c.c. of urine, which had a specific gravity of 1000 to 1004, and contained neither sugar nor albumin. Withdrawal of liquid was easily borne for as long

as thirty-eight hours, and the urine was reduced to *nil*. The patient became exceedingly thirsty, but there were no general symptoms. He was given large quantities of water after this prolonged abstinence, and very promptly the excretion of urine increased to a high point. The decline of the amount was also very rapid. The blood seemed to be less concentrated than normal, but after loss of water due to excretion and the enforced abstinence, it became inspissated. The nitrogenous metabolism was increased. Sodium chloride was present in the urine in decreased quantities. There was no inosite in the urine. The insensible perspiration was decreased.

As general conclusions, Strubell first points out that it is possible to distinguish two forms of diabetes mellitus, the severe and the mild. In either of these forms more water is excreted than normal. In the mild cases after abstinence from water for some hours, the secretion of urine may be suppressed without producing any severe general symptoms, excepting thirst. In the severe form the suppression of the urine for any length of time is not possible. It seems as if these patients secrete so much urine, and derive so much of it from the tissues, that a prompt administration of water is required when an attempt has been made at abstinence. He classifies his second case as one of mild variety. As a result of his observations in these cases in comparison with healthy individuals he makes the general statement that the healthy individual is tachyuric, and when cases of mild diabetes insipidus are studied and discovered to be of the same character, as was true of his own and Kraus's cases, it is an evidence of the degree of normality. Finally, in conclusion, he points out a variety of indications in his own studies which showed that the polydipsia is the primary disturbance, and polyuria the secondary and consequential.

Intracranial Lesions in Relation to Polyuria. As contrasts to these cases of Strubell, the following are of interest in showing the intracranial lesions that may be associated with the symptom polyuria: A. Spanbock and J. Steinhaus¹ record an interesting case of double hemianopsia and diabetes insipidus in a woman, thirty-three years of age. When nineteen years old she had had syphilis, which was not sufficiently treated. Two children were subsequently born dead, but she had four healthy children. When about thirty-one years old, she noticed that she was passing large quantities of urine, was losing flesh, and also that it was necessary to turn her head completely in order to see things placed at her side. An examination showed that there was bilateral hemianopsia. The urine was passed in quantities as great as seven litres a day. Sugar was absent, and the specific gravity was 1002 to

¹ Deutsche med. Wochenschrift, December 29, 1898.

1003. The urea was from 0.04 per cent. to 0.07 per cent. Antisyphilitic treatment caused entire disappearance of the eye-symptoms, and later her general health became entirely normal, so that the authors feel that their diagnosis of a syphilitic lesion in the middle of the chiasm was confirmed. Eleven similar cases collected from the literature are reported. The records in six were so incomplete as to render the diagnosis doubtful, while four others are uncertain as to the conjunction of polyuria and bilateral hemianopsia; in only one case is it certain that there was a combination of the two conditions.

Diabetes Insipidus in Pregnancy. Vinay¹ has observed two cases of diabetes insipidus in pregnant women. The effect of diabetes insipidus upon pregnancy seems to be quite similar to that of diabetes mellitus; it may cause the interruption of the pregnancy, and the prognosis is not without gravity. One of the cases which he reports died from pulmonary embolism twenty-nine days after labor, and the other of rapidly progressing tuberculosis of the lungs.

GOUT.

Etiology and Pathology. Notwithstanding the numerous investigations of this disease the actual causal agent is still unknown. It is quite certain that many of the older notions regarding uric acid were based upon incomplete or imperfect observations, and as far as the relations of diet to uric acid production and excretion are concerned, it has been shown quite conclusively that the amount of uric acid is only indirectly dependent upon the kind of food. Some have sought to show that certain kinds of food, notably red meats, cause such an increase in the amount of uric acid that the normal uric acid—urea ratio is greatly disturbed, and, further, that under these circumstances there is developed a strong tendency to gout. These assertions seem to be disproved by accurate metabolic studies. The amount of urea in the urine is directly due to the kind and quantity of the food, but the quantity of uric acid is dependent wholly upon tissue consumption, and is, therefore, only indirectly dependent upon the food. There are other equally interesting problems which require solution, and on the whole the pathology of gout still offers a broad field for study. Authorities in general, however, are of the opinion that uric acid is concerned in some rather intimate way with gout and the gouty paroxysms, though they differ greatly as to the nature of the relationship.

Magnus-Levy² has studied the alkalinity of the blood and the propor-

¹ *Gaz. Hebdom. de Méd. et de Chir.*, November 24, 1898.

² *Verhandl. des XVI. Congr. f. innere Med.*, Wiesbaden, 1898.

tion of uric acid it contains in gout. The very simple teaching of Garrod, of the nature of gout, is not at the present time acceptable. He held that during the attacks of gout the uric acid is decreased in the urine in consequence of its retention in the body. He further believed that the deposit from the blood, of urates in the tissues, occurs in consequence of an increased quantity of uric acid, or because the blood has suffered a reduction in alkalinity and is no longer able to retain urates. The investigations of Magnus-Levy show all of these assumptions to be untenable. The quantity of uric acid in the blood during the attack and before the attack is not increased, and the alkalinity of the blood is not diminished. If uric acid is the *materia peccans* of gout, one must assume local disturbances and local changes in alkalinity, etc., as does Ebstein. Similar conclusions as to the blood were reached by Luff,¹ who estimated its alkalinity in a patient suffering with subacute gout, and found that it was about equal to the average. There was no relationship between the alkalinity of the blood and the reaction of urine during an attack. The assumption, however, that some local cause, such as local disease or alterations of alkalinity, accounts for the gouty paroxysms and deposits, wants verification.

In a recent discussion tending in this direction, C. Mordhorst² advocated the importance of uric acid or the urates as causes of disease, and contributes a study of the solubility of urates at various temperatures. He finds that urate-spheres are precipitated from sodium solutions, saturated with uric acid, less easily when the solution is warm than when cold. He notes, further, that the higher the temperature of the soda solution the more neutral or less alkaline salts must be added to cause precipitation of the urate-spheres, and the reverse. When a warm soda solution, which is not completely saturated with uric acid, is lowered in temperature, urates are precipitated, but a return to the warmer temperature will cause a resolution. He points out that protracted, though not intense cold, applied locally, may induce localized rheumatic symptoms in healthy persons, and he believes this results from the precipitation of urates in the fibrous and connective tissues, with a consequent obstruction of the lymphatic spaces and secondary circulatory disturbances. The effect of hot baths, etc., is due, he holds, to the solution of the precipitated urates. He believes that the general symptoms, such as increased pulse tension, headache, etc., to which Haig has given the term *collæmia*, are due to the obstruction of small capillaries by agglutinated masses of urates that have been carried into the circulation from their place of local precipitation.

The administration of antipyretic remedies sometimes removes rheu-

¹ British Medical Journal, April 23, 1898.

² Centralbl. f. innere Med., July 9, 1898.

matic pains produced by cooling the skin, because the dilatation of the capillaries induces activity of the lymphatic streams and warming of the juices of the body. He believes that there is such a difference in the alkalescence of the blood and the lymph that there may be an acidity of the latter, even with normal alkalinity of the blood, and consequently an attack of acute gout. Interesting as such theories appear they contribute little to our permanent knowledge.

A still more speculative view is expressed by G. W. Balfour,¹ who contends that the attack of gout is due to thrombosis of the vessels about the joint, basing this opinion upon the fact that there is not excessive heat in the affected joints, that some observers have found the temperature lower than that of the surrounding parts, and also upon the fact that there is early turgescence of the veins, redness, and pain, and that massage, which was employed by some of the earlier clinicians, though relinquished on account of its painfulness, relieved the pain of the attack.

While such reflections may afford some justification for a suspicion of vascular disturbances, they cannot lead to any conclusions of a practical sort. An equally inconclusive attempt to solve the cause of the local disturbances is recorded by E. Schmoll.² This writer suggests that gout is due to the retention of nitrogenous products of metabolism, which cause the necrotic areas which Ebstein has demonstrated in this disease. Such retention of nitrogenous substances has, he claims, been demonstrated, and if it reaches a certain degree would probably cause necrosis. The necrotic areas, then, in his view, furnish nuclein, and from this is derived the excessive amount of uric acid which seems to be present in the urine of most gouty patients during the attack. It might, however, be objected that the amount of uric acid is wholly out of proportion to the local lesions in many cases. He suggests that further studies of gout should include the investigation of the character of the substances that are retained in the organisms of gouty people and the circumstances under which this retention takes place. That an excess of uric acid in the blood is not the cause of gout is admitted, and the investigations of the amount present in the blood of gouty people give entirely varying results; the average amount found is within the normal range.

Clinical Relations of Gout. J. Mickle³ records his conclusions from the study of a large number of insurances issued to individuals with gout. An extra premium had been charged because of the existence of the gout, but this premium, he states, was too low. The expected deaths among 525 individuals were 120, while 160 was the actual number which

¹ *Edinburgh Medical Journal*, June, 1898.

² *Centralbl. f. innere Med.*, October 22, 1898..

³ *British Medical Journal*, September 17, 1898.

took place. The increase of premiums should, therefore, be 33 per cent. in theory; but when individuals are beyond seventy years of age, even though they be gouty, the expectation of life is nearly the same as in those in good health, so that this would reduce the excess of premium somewhat. Since the first series of observations 272 insurances were still active upon the lives of gouty individuals who belonged to the first series, and 210 of these cases had been under observation; the expected deaths were 111, while the actual deaths had been 184, an excess here of 66 per cent. The 184 individuals who died had a total expectation of life somewhat over 3132 years, but they lived only about 2190 years, which indicated that each individual's life was about five years shorter than expected. Drinking alcoholic beverage of poor quality seemed to be very effective in producing gout, since six times as many inn-keepers and five times as many brewers die of the disease as do normal individuals, and gout is about three times as frequent in the English soldiers in India who are intemperate as it is among those who are temperate.

OBESITY.

The clinical study of obesity has received little attention excepting as it relates to treatment. The older methods, involving careful feeding, with regulation of exercise, have become less conspicuous by reason of the introduction of thyroid treatment. These older methods, however, are by no means superseded.

Kisch¹ recommends great reduction in the food as most important in the treatment of obesity. There should be sufficient proteid food, a moderate amount of carbohydrates, and very little fat. The highly spiced foods are improper because they increase the appetite. Regular exercise is important and should be governed by the condition of the heart. Sleeping during the day should be avoided. Life in the open air is advantageous.

The Thyroid Treatment of Obesity. This needs most careful supervision. While many authors state that they have never observed untoward symptoms, others have seen alarming indications and have been constrained to discontinue the treatment. It is not improbable that there is some difference in the pathology of cases of obesity, and variability in the results of different clinicians may be explained in this way.

C. C. Aesterbrook² has experimented upon insane patients, administering to them extract of the parathyroid and of the thyroid gland. The former was taken from an ox and given in the dried and fresh state by the mouth or in glycerin or ethereal extracts under the skin. No effects

¹ *Wien. klin. Wochenschrift*, March 13, 1898.

² *Lancet*, August 27, 1898.

were observed. Thyroid extract administered in doses of 60 grains every day for six or seven days caused considerable loss of weight, amounting to seven or eight pounds. In most of the cases there was moderate elevation of temperature and in a small number a considerable elevation. The action of the skin was increased. The hæmoglobin of the blood was reduced, and certain general symptoms, notably headache, tingling, tremors, palpitation, and syncope were observed. The respiratory rate was increased from six to ten per minute in some of the cases. The appetite was diminished at first, and subsequently increased. He believes that the drug is a powerful catabolic stimulant, accelerating oxidation of the tissues.

Magnus-Levy,¹ in a study of the respiratory exchange of gases in myxœdema, Basedow's disease, obesity, and in persons fed with thyroid extract, used the Zuntz-Geppert method, and came to the following conclusions: The loss of weight caused by feeding with thyroid gland is due to the loss of fat as well as loss of water and proteid; this loss is due to increased consumption even in a state of rest, and is usually moderate, excepting in myxœdema, amounting to from 40 to 50 grammes of fat per day; there is a greater loss of fat in consequence of increased exercise, and in long-continued feeding the loss of appetite plays an important part; the increased consumption of tissue in a state of rest does not take place in all persons; it is most marked in cases of myxœdema; the increased destruction of albumin is toxogenic and is variable; it may occur in cases in which there is an excessive amount of food; thyroïdin acts similarly, but thyro-antitoxin and iodide of potassium are inactive.

W. MacLennan² reports three cases of obesity treated with a preparation of thyroid gland, known as thyroglandin, of which one grain was given three times daily for a few days, and then rapidly increasing doses until nine grains daily were administered. There was rapid loss of weight without unpleasant symptoms, such as are experienced from other preparations.

RHEUMATOID ARTHRITIS.

Some authors would classify this disease as an infection. Thus v. Dungen and Schneider,³ who have isolated small diplococci which stained by Gram's method, from the exudate in the joints of a case dying after presenting the clinical picture of extreme arthritis deformans, regard this organism as the cause of the disease. The organism grew in all media, but did not develop quickly; glucose bouillon was found to be the

¹ Zeitschr. f. klin. Med., vol. xxxiii., S. 269.

² British Medical Journal, July 9, 1898.

³ Münch. med. Wochenschrift, October 25, 1898.

best culture medium. Similar micro-organisms were obtained from the liver, and injection of cultures of this diplococcus into the knee-joints of rabbits gave rise to a process similar to rheumatoid arthritis. The authors, after stating with somewhat rash positiveness that the organism is the cause of the disease, even suggest that since the germs were very abundant in the gall-bladder the source of the disease was probably a chronic affection of this viscus.

As opposed to these views, based upon experiment, we may cite the equally inconclusive clinical observations of L. Badt,¹ who believes there is a connection between this disease and certain of the sexual functions. It has seemed to him that a cessation of the periods is of great etiological importance and has suggested the use of ovarian tablets in the treatment.

B. H. Rachford² believes that arterio-sclerosis and rheumatic gout are often caused by a lithæmic state, though this opinion, as well as the term rheumatic gout, has long since been discarded by most authorities.

G. A. Banatyne³ reports two cases of pericarditis in rheumatoid arthritis, in one of which the signs of pericarditis developed rather late in the course of the disease. In one there had been pneumonia, diarrhoea, and some form of eruption in the skin, while in the other herpes had been observed. The condition of the joints improved after the development of the pericarditis, and he suggests that some toxic substance, generated by the infection which caused the pericarditis, may have had a beneficial effect upon the rheumatoid arthritis.

OSTEOMALACIA.

Practically nothing of any consequence has been learned regarding the nature of osteomalacia in recent years. The rarity of the disease, of course, accounts for the meagre information and prevents progress of knowledge. The etiology is still very obscure, and the disease is difficult to recognize in its earlier stages. Prompt diagnosis is essential to satisfactory management, and we may quote as of interest the recent report of P. Rissmann,⁴ who discuss particularly the early symptoms. He points out that there are symptoms of this disease, to which neurologists have directed attention, which make the diagnosis possible although no marked deformities of the bone are present. Among these symptoms are tenderness on pressure, especially of the spine in the lumbar region; paralytic conditions of various muscles of the pelvis and

¹ *Verhandl. des XVI. Congr. f. innere Med.* Wiesbaden, 1898.

² *Philadelphia Medical Journal*, April 16, 1898.

³ *British Medical Journal*, January 15, 1898.

⁴ *Monatschr. f. Geburtshilfe und Gynäkol.*

thigh, especially the flexors and abductors, which lead to a peculiar waddling gait; peculiar subjective disturbance, such as a feeling of weight in the legs, pain at night, and muscular tremors, which are either of osseous or neural origin.

Bernstein¹ found in a typical case of osteomalacia that oöphorin in large doses caused no improvement, while administration of phosphorus brought about a favorable change.

SCLERODERMA.

This is one of those diseases of doubtful nature which suggests a metabolic basis. The peculiar association with other disorders of metabolism lends probability to this view. In an interesting paper Dercum² describes a case associated with rheumatoid arthritis, another of the diseases probably dependent upon disorders of metabolism for its causation. He describes two cases of scleroderma, and expresses his belief that the local and general forms are identical, and that the disease may involve tissues other than those of the skin. This is emphasized by the occurrence in the second case of a typical and very severe rheumatoid arthritis. The disease began with involvement of the knee, and progressed until almost all joints were involved and were totally ankylosed. There were numerous patches of yellow incrustations over the scalp and the skin of the neck, ears, and limbs. When these were removed raw surfaces were left. The skin was in some places pigmented and less movable than normal, and in the lower thirds of the legs it was tense and shining; sensation was not disturbed, and there was no pain except upon movement.

L. Samouilson,³ in studying the pathogenesis of scleroderma, notes that the coexistence of this disease and of alterations of the thyroid gland is not rare; therefore, a relation between scleroderma and myxœdema seems quite possible, and it seems within reason that scleroderma is due to an intoxication resulting from abnormal action of the thyroid body. He recommends that thyroid medication be given a more general trial in scleroderma in view of the successes that have already been obtained by this method.

MYXŒDEMA.

Etiology. The pathological and clinical evidence in favor of the thyroid origin of this disease is overwhelming, but there are still a

¹ Münch. med Wochenschrift, April 5, 1898.

² Journal of Nervous and Mental Diseases, October, 1898.

³ Thèse de Paris, 1897-1898.

most number of physiologists who deny that the connection between the myxœdematous state and the thyroid disease has been proved. It will be necessary for the physiologists to prove the fallacy in these experiments, for the profession in the meantime accepts without question the evidence and conclusions of the pathologist and clinician. A number of cases might be collected from the literature in which some definite disease of the thyroid gland was followed by signs of myxœdema. A recent one is reported by E. Shields.¹ The patient, a girl infant, had been entirely normal until it was ten months old. At that time she had an attack of fever with symptoms of acute thyroiditis, consisting of swelling of the gland and symptoms of pressure from its enlargement. Nothing abnormal was seen in the throat. The attack lasted one week and was followed by entire atrophy of the thyroid gland; subsequent to this the child's development ceased and she acquired the typical cretinoid characters. Her height, at the time of the report, was thirty-three inches, her weight thirty-three pounds, and the child was then seven years old.

Considerable attention has been paid to the direct symptoms that may be caused by diseases or injuries of the thyroid gland, and observers are almost uniformly convinced that fever and the other acute manifestations suggesting an intoxication may be produced. These symptoms, to which some give the name thyroid fever, and others thyroidism, are to some extent like certain symptoms seen in Graves' disease, and further reference will be made to them in discussing that affection.

Berard,² in discussing thyroid fever, so called, which he has observed in a number of cases attending operations for goitre, states that the characteristic feature consists of rapid elevation of temperature, usually on the day following the operation, with subsequent morning remissions and a decline by lysis or crisis. The general condition of the patient is not proportionately affected. The phenomena, he holds, are due neither to infection nor acute myxœdema, but to intoxication resulting from absorption into the circulation of an increased amount of glandular secretion, caused by irritation of the nerves during the operation. He instances the confirmatory results of injections of glycerin extracts into rabbits, the symptoms resulting being wholly comparable to those observed in the disease noted.

A clinical observation of interest in this connection is reported by Osler,³ under the heading "An Acute Myxœdematous Condition, with Tachycardia, Glycosuria, Melæna, Mania, and Death." The patient, a man of thirty-one years without any family history bearing on his case, who had enjoyed excellent health and was of exemplary habits, began

¹ New York Medical Journal, October 1, 1898.

² Gaz. Hebdom. de Méd. et de Chir., December, 1897.

³ Journal of Nervous and Mental Diseases, February 18, 1899.

in October, 1896, to show signs of rapid increase in size, and by January 1, 1897, his weight had increased from 145 to 182 pounds. The abdomen swelled conspicuously, as if he had dropsy, and he looked as if he were bloated from drinking. He became sleepless and irritable, and suffered with diarrhœa, the stools being dark and having the appearance of containing blood. He became exceedingly weak, and finally grew restless and "queer in the head." He went to Florida, and becoming much worse returned home. When seen by Osler his mind was clear, his general appearance was bloated, his face flushed, his eyes somewhat prominent, but without Gräfe's sign and with no restriction of the lids or impairment of the power of convergence. The neck was thick, the supraclavicular pads large, the sternal notch practically obliterated, and the thyroid gland could not be felt. The thorax was reddened, the abdomen was very full and marked by large atrophic lineæ at the sides. There was no pallor or muddy hue of the skin anywhere, nor any tumor, but the skin was uniformly infiltrated and firm, particularly over the backs of the hands and over the cheeks. The skin was constantly dry. The pulse was rapid, but the heart-sounds were clear. The spleen was not enlarged. It could not be determined positively whether the liver was enlarged or not, but percussion gave no increase in the area of dulness. The appetite had been good. After his return from Florida he had, on several occasions, watery diarrhœa with blood, and increasing weakness led to profound prostration. There was a slight tremor of the fingers, but no more than the feebleness could explain. Sensation was normal everywhere, the knee-jerks were present, and his mind remained clear, though he was somewhat dull. The temperature was normal, but he felt hot and flushed. He passed nearly eighty ounces of urine within fifteen to sixteen hours, and upon examination this was found to be of a deep yellow color, 1029, with much albumin and sugar. There were a few fine granular casts present. He was given thyroid extract, and after taking 25 grains marked maniacal symptoms developed; the temperature rose suddenly to 103°, but rapid diminution of the infiltration of the skin was observed. There was really a marvellous change in the appearance of the patient. The mental condition became somewhat quieter, but was still greatly disturbed. The clinical picture in this case, according to the author, presents certain combinations of myxœdema with exophthalmic goitre, and, as far as he can find in the literature, the case has no counterpart. Those instances of combination reported previously have been cases of myxœdema following exophthalmic goitre at a variable period of months or years. In Osler's case the man's increase in weight within three months was great, but his appearance was not that of an ordinary myxœdemic. The author never himself observed exophthalmos in the case reported, but notes that the attending physician had

seen it on one occasion. Undoubtedly many of the symptoms detailed in this case must be regarded as due to toxæmia, and the source of the poison was most probably the thyroid gland.

An experimental contribution to the study of the effects of thyroid disease is recorded by A. G. Levy,¹ who removed the thyroid glands from a number of dogs, taking great care to excise the parathyroids simultaneously. The anæmia that resulted was never marked, but leucocytosis always occurred, though it was variable in degree. The specific gravity of the blood was lowered, and the proteids reduced in quantity, though the fibrin was increased. The blood changes apparently bear no relation to one another, nor do they resemble those met with in ordinary cachexias. It does not seem to me that the mere post-operative changes are sufficiently considered.

A clinical or therapeutic contribution bearing on the same general subject is reported by Conche.² Two cases of thyroid poisoning occurred in men who had taken the drug for the reduction of flesh. The first case was not of especial interest, showing the usual symptoms. The second case, however, was unusual in several features. After taking for about six weeks a tablet, first of thyroidin, and later of iodothylin, after each meal, the patient began to have severe abdominal pains, his bowel movements became infrequent and painful, and there was a decided decrease in the amount of urine secreted, though it did not show either albumin or sugar. A generalized swelling of the lymphatic glands over the upper portion of the body then appeared; the memory became poor; there was continual somnolence, a constant feeling of coldness and progressive weakness, and, finally, there was a generalized prolonged furunculosis. These symptoms were protracted over a period of nine or ten months, and are attributed to intoxication of the system by an impure preparation. This view is supported by the observation of the generalized involvement of the lymphatic glands, which indicated a toxæmia. Similar reports have been recorded as evidences of toxic action of the thyroid products. These reports must be carefully studied before they are admitted to have weight. Decomposition of the thyroid tissue may occur so readily that putrefactive products should be assumed to be present when toxic symptoms are observed, unless decomposition can be reasonably excluded.

R. H. Cunningham³ records a case of interest in this connection. A man of thirty-four years, who had myxœdema, was under treatment with thyroid extract; improvement began at once. Subsequently thyro-colloid was used, and though the patient took immense doses of the

¹ British Medical Journal, September 3, 1898.

² Lyon Médicale, August 14, 1898.

³ Journal of Mental and Nervous Diseases, June, 1898.

colloid preparation, macerated one hour (sometimes equal to 24 grains of raw thyroid), there were no symptoms of intoxication; but when the colloid preparation was used, macerated for eighteen hours, immediate symptoms of mild intoxication appeared. Cunningham holds that this indicates the truth of a previously expressed belief that the symptoms are the results of the action of certain decomposition products.

A case of some interest in an etiological sense is recorded by Connal.¹ The suggestion is entertained that medical use of potassium iodide may have accelerated the development of myxœdema. This opinion seems to me at least doubtful. The case occurred in a man thirty-six years of age, who stated that the condition, in his belief, was originated by the administration of potassium iodide, since he had taken 10 grammes just before the myxœdema developed, and on the following morning had become comatose. He regained consciousness and recovered in two days. Doses of two grammes of potassium iodide, however, when subsequently administered, caused marked iodism. Swelling of the eyelids came on and persisted, and myxœdema developed progressively. Connal thinks it possible that the iodide might have caused some acceleration of the cause of an incipient myxœdema. When seen for the latter affection the man was ordered one-third of a sheep's gland every second or third day, but by mistake three glands were given him; this caused great rapidity of the pulse, increase of temperature, nausea, vomiting, severe diarrhœa, and jaundice. He did not fully recover for two months and declined further thyroid treatment. Five years later, however, he presented himself for treatment because of some deafness and marked tinnitus aurium, and without his knowledge was given thyroid gland; the result was marked improvement in his hearing and general condition. The disturbance of hearing was probably due to the swelling of the mucous membrane of the nose and throat, which was present before the thyroid was given.

Symptoms. Nothing of any consequence has been added to previous knowledge regarding the symptomatology. The relations of myxœdema to cretinism and allied conditions is more generally recognized, but the clinical course remains as it was originally described. W. M. Ord,² in discussing myxœdema and allied conditions, states that the diagnosis of myxœdema is usually readily established by proper attention to the changes in the skin, which affect both the epidermis, the hair, the glands, and the organs of touch. The mucous membrane also is frequently affected, with resulting loss of teeth and of the glandular functions connected with the mucous membrane. The swelling in the skin is not dropsical, does not gravitate, and does not pit on pressure. Asso-

¹ *Glasgow Medical Journal*, October, 1898.

² *British Medical Journal*, November 12, 1898.

ciated with this change in the skin there are evidences of slowness of function of the nervous system, and the speech is peculiar and typical, owing partly to lack of nervous control of the muscles of articulation, partly to the swelling of the muscles themselves, and partly to the swelling of the lips and fauces. These are the symptoms of the first grade. In the second degree of severity there are low temperature and a tendency to hemorrhage as the result of slight injury. Females are more affected than males.

The peculiar want of development in infantile myxœdema or cretinism is the most interesting feature in the disease. The introduction of Röntgen skiagraphy has made continued studies possible. Heretofore the uncertain chances of autopsies at different ages were the only means of determining the progress of bony development.

Garne and Londe¹ have applied the X-rays to the study of a case in a patient nineteen years of age, who had all the signs of myxœdema. The Röntgen rays were used to study particularly the process of ossification, and it was found that the epiphyses of the bones were like those of a child two and a half years old. In the hand only three carpal bones were found developed. The epiphyseal centres of the metacarpal bones were scarcely visible, and were entirely absent in the phalangeal bones, excepting those of the third phalangeals of the middle and ring fingers. The patient, who was treated with thyroid gland in substance, and consumed sixty-one glands within a period of four months, was found to have progressed considerably in the process of ossification. Two more carpal bones made their appearance in the skiagraphs, and the metacarpal and phalangeal bones all had developed from epiphyseal centres.

W. Muratow² records a case of cretinism which occurred in a girl six years of age. The early signs of the disease were noticed shortly after her birth, when she seemed to be abnormally stout and had scanty hair and a dry skin. When she was six years of age she measured 73 cm., her head was small in the frontal region, the muscles showed excessive mechanical and electric irritability, and the patient's appearance in all respects was that of a typical cretin. Acute pneumonia caused death. Post-mortem the thyroid was found to be absent, but there were a few scattered gland-tubules overlying the first cartilage of the trachea. The cells in the cerebral cortex were swollen and varicose, but did not show abnormal staining. The tangential and short arciform fibres stained poorly, and the latter seemed to be thinner than normal and fewer in number. There was a thick neuroglial network, and the neuroglia cells were present in excessive number. These changes in the cortical

¹ *Compte-Rendu*, 1898, No. 12.

² *Neurologisches Centralbl.*, October 15, 1898.

cells are similar to those found in intoxications, and the changes in the arciform fibres were probably secondary and due to interference with their development.

B. Bramwell¹ describes a case of typical cretinism which occurred in a woman thirty-six years of age, the most striking point in the case being that menstruation began in her twenty-fifth year, and had continued up to the time of the report. The disease had shown its first symptoms when she was three years old, and had progressed constantly. She was but thirty-six inches in height and had the characteristic facial expression ; her hair was coarse and dark, though pubic hair was absent. There were large fatty growths above the clavicles and in the left axilla ; the hands were large and broad ; there was no perspiration, and the skin was yellowish in color, dry and coarse. There was imperfect development of the nipples and breasts. The intellectual condition resembled that of a child of about five years. The patient refused to take thyroid treatment.

G. R. Murray² records four cases of a condition which he terms "early thyroid fibrosis." The patients presented a yellowish tinge of the skin, with a marked pink flush of the cheeks, which made them appear in good health at first glance, though upon closer observation the real color of the skin was evidently unhealthy. The face appeared broad and somewhat heavy, though there was only slight swelling of the subcutaneous tissues ; the skin felt dry and was somewhat scaly, and there was sometimes a loss of hair ; the individuals were languid, and readily fatigued ; they sometimes suffered from optical or auditory hallucinations ; their temperature was not uncommonly subnormal. Improvement followed the use of thyroid extract, and this seems to be Murray's chief reason for attributing the condition to disease of the thyroid, for in none of the cases did he have an opportunity to make a post-mortem examination, and there was no other definite reason for believing that the thyroid gland was at fault.

EXOPHTHALMIC GOITRE.

Etiology. Authorities are quite generally inclined to regard exophthalmic goitre as a disease dependent upon disordered secretion of the thyroid gland. The older nervous theories, which located the disorder in the central nervous system or in the sympathetic nerves, have been discarded by all but a few investigators. The results of physiological experiment, of thyroid therapy, and the study of the metabolic conditions, all point to derangement of the thyroid gland as the fundamental cause of the disease. The following report is of interest in this connection :

¹ *Lancet*, December 10, 1898.

² *British Medical Journal*, October 1, 1898.

Von Notthaft¹ describes a case of "artificial acute thyrogenous Basedow's disease," and adds some investigations into the function of the thyroid gland and the etiology of Basedow's disease. Thyroidism, according to the author, is not due to a quantitative increase in the activity of the thyroid gland, but rather to a qualitative alteration of action. The case reported is as follows: An obese man of forty-three years began to subject himself to thyroid treatment, taking English tablets of 0.3 grammes, and consuming nearly 1000 tablets in five weeks. He lost twenty-eight pounds in weight. At the end of the third week, however, discomfort began in the form of an irritative cough, considerable swelling of the neck, and later, great thirst, palpitation, difficult breathing, depression, sleeplessness, beating of the vessels of the neck, and marked sweating. Examination now showed distinct exophthalmos, tremor of the hands, decided increase in the girth of the neck, and palpable enlargement of both sides of the thyroid gland. There was marked pulsation of the carotids, a pulse of 120, and increase in the size and force of the heart-beat. Stellwag's and Gräfe's symptoms were present, and there was marked tremor of the tongue. There was no albumin in the urine, but once sugar was present. After cessation of the thyroid treatment, the symptoms ameliorated, the sugar disappearing from the urine, though the pulse did not become slow for four weeks. After one-half year all the symptoms disappeared, excepting enlargement of the gland, exophthalmos, and the other ocular phenomena. Eventually these slowly subsided. This case showed all the symptoms of Basedow's disease, but the satisfactory outcome of the case is at variance from the usual course. Thyroiditis may be excluded. The author considers his case as one of thyrogenous Basedow's disease. The favorable effect of the thyroid treatment upon some cases of this disease is explained by the author upon the assumption that improper secretion of the gland is substituted by a normal material, but in the treatment the entire amount of thyroidin administered must not be sufficient to bring about the symptoms of thyroidismus. After a review of the various theories concerning the etiology of this disease, the author states his belief that the disease resides in the thyroid gland, the epithelium of which becomes hyperplastic and also partly hypertrophic, and atypically multiple. Diseased secretion is, therefore, manufactured and discharged into the blood. The disturbances of the nervous system are secondary. The nervous theory of origin of the disease is untenable, though undoubtedly neuropathic individuals are more easily affected. A single theory does not explain the fundamental condition in all cases. Thyroidismus may be caused by improper preparations of thyroid gland, by too much thyroidin, or by qualitatively altered thyroidin.

¹ Centralbl. f. innere Med., 1898, No. 15.

M. Askanazy¹ reports some extremely interesting histological results from his study of the muscles of cases of exophthalmic goitre. In two cases which died with evidences of profound exhaustion, and, at the end, of cardiac failure, the muscles were found to be very fatty. In another case death followed operation for partial thyroidectomy, and in a fourth case acute appendicitis caused the fatal ending; in both these cases also the muscles were fatty. The whole voluntary muscular system was affected, but in all the cases the diaphragm was most severely involved. The color of the muscle was pale and yellowish, and the tissue showed streaks of fatty material, the amount of involvement varying in different portions. In the earliest stages the microscope showed affection of the nuclei, the chromatin was swollen and showed irregular, striking figures; later the muscle-substance became granular and the transverse striations became obscure. At the end the muscle-fibre became changed into a granular or sometimes homogeneous mass. Finally, in some situations the muscle was completely replaced by fat. The neuro-muscular bundles often showed the greatest amount of change. There was no fatty degeneration of the heart, but it showed brown atrophy.

Askanazy considers this muscular change the result of a toxæmia. It was not a nervous change, for the nerves were not affected. It is probable that it is the cause of the excessive muscular weakness exhibited by some of the patients, and perhaps it may partially explain the protrusion of the eyeballs, owing to weakness of the ocular muscles; it may also be a partial explanation of the paresis described by Charcot.

Symptoms. The clinical course, in certain cases, in itself suggests a toxic character of the disease, as in instances like the following, in which abruptness of onset, fever, sweats, etc., all suggested an intoxication or infection.

W. Hirschlaff² records an important case of exophthalmic goitre of exceedingly acute course, death occurring about five months after the appearance of the first symptoms. With the usual general symptoms of loss of strength and weight there rapidly appeared enlargement of the thyroid gland, brownish pigmentation of the skin, choreiform movements of great severity, and a very notable tremor of the hands. The pulse became very frequent. The patient had severe sweats, and there was pronounced polyphagia and polyuria, and the Gräfe, Stellwag, and Moebius signs were quite distinct. Fever occurred at times, running an irregular course, and severe hysterical attacks were also occasionally present. The symptoms decreased markedly for a time, but there was a sudden change for the worse, and the patient died with pyrexia. At the post-mortem examination there was no evidence of infection, but

¹ Deutsche Archiv f. klin. Med., September 6, 1898.

² Zeitschrift für klin. Med., Band xxxvi., Heft 344.

there was an adenoma of the thyroid, and hyperplasia of the thymus and of the follicles of the tonsils, the stomach, and the intestines. During a period of over-feeding the patient took the enormous quantity of 5300 calories of food daily, only about 360 calorie-values being excreted with the feces, in spite of the fact that the bowel movements were very loose. The total quantity of nitrogen retained within the forty-six days, during which the experiments were carried on, was 297.5 grammes. The highest balance in one day was 9.1 grammes. Of the 5300 calories which she ingested daily it was found that only about 1200 calories were used in producing tissue, the remainder being lost in respiration and in the severe choreiform movements. Her respiratory interchange was 77 per cent. greater than that of a normal girl of about the same weight, and during the last three weeks of life the interchange in respiration increased very strikingly, even when compared with the high figures that had been found before. Hirschlaff believes that this explains the course of this case and of others similar to it. He says that with increasing lack or excess of thyroid secretion, there is a corresponding increase in oxidation and in heat elimination, but at times so much heat is produced that the body cannot rid itself of the excess, and fever results. If the heat-regulating mechanism is sufficiently powerful the temperature soon becomes normal; sometimes, however, this mechanism seems paralyzed, and then death occurs during a period of pyrexia. He believes that this case is strong evidence for the intoxication theory of exophthalmic goitre.

Occasionally cases are observed in which one or another of the cardinal symptoms of Basedow's disease are wanting; and most frequently one or another of these symptoms is only imperfectly developed, as in the following case: Armaignac¹ exhibited a young girl who had marked exophthalmos of the left eye, while the right appeared entirely normal. Digital examination of the orbit and auscultation showed no abnormalities, and the movement of the eyeball was entirely normal. There was marked tachycardia, tremor of the hands and some enlargement of the right lobe of the thyroid. The patient was exceedingly nervous, and came of a nervous family. Gräfe's sign was absent, the upper lid accompanied the movement of the globe, and the eye could be closed as readily as the one that appeared normal.

Diagnosis. It must be recalled that every exophthalmos is not of necessity an accompaniment of Basedow's disease. Sometimes the symptom is due to venous stasis of heart disease; more often it is caused by anæmia.

O. Scheffel's² reports an interesting case of periodical exophthalmos

¹ *Gaz. Hebdom. de Méd. et de Chir.*, November 17, 1898, p. 1192.

² *Deutsche med. Wochenschrift*, June 2, 1898.

occurring in a woman twenty-one years of age. She first noticed that her left eye became prominent after straining or bending forward. This was accompanied by distress in the head and dimness or cloudiness of vision, most marked at the periods. When she was in repose, or standing erect, the eyes were normal, and pressure over the jugular vein caused the exophthalmos to appear at once. No cause could be discovered for this peculiar condition; the patient had not been in the habit of wearing tight collars or bands about the neck. The use of a tonic mixture and cold affusions to the abdomen relieved her completely. The author has collected twenty-three cases, and classifies them as of congenital, traumatic, reflex, mechanical, and unknown origin. His own case belongs to the last variety, of which he finds thirteen instances. The prognosis is always good. The condition is of interest from its clinical relations with exophthalmic goitre.

Treatment. THYROIDECTOMY. The results of partial extirpation of the thyroid gland have been so flattering that this operation cannot but be admitted to approved surgical procedures. It does not follow, however, that operation is indicated in every case, or that untoward results are not possible, even when the operation is carefully performed. The subject, however, is more appropriately referred to in Volume I., page 19. The following cases are of interest in this place in their bearing upon the operation as well as upon the nature of the thyroid disorder :

J. A. Booth¹ records eight cases of Graves' disease in which partial removal of the thyroid gland was practised, with the result that five of the cases recovered. One case perished, probably of uræmia. In one there was no change, and in the last there was a continuous improvement during six months after the operation. The course of improvement observed by Booth has been the same as that observed by others. The gland first decreases in size, then the nerves sometimes disappear. The pulse-rate and vasomotor symptoms subside, and finally the exophthalmos disappears. Notwithstanding the happy results observed in his case and in cases of others, Booth points out that operation cannot be recommended as a routine, since the mortality of the operation is estimated at 7 per cent. He refers to the obscurity of the etiology of the disease, and also the unexplained sudden death which sometimes occurs after operations. He inclines to the view that the disease is one of neurotic origin primarily, with secondary disturbance of glandular secretion.

F. T. Paul² describes two cases of thyroidectomy with unpleasant symptoms; one of the cases ended fatally. The symptoms of both cases are attributed by the author to absorption of thyroid secretion through the wound.

¹ Medical Record, August 13, 1898.

² British Medical Journal, January, 1898.

OPERATIONS UPON THE SYMPATHETIC. What I have previously stated regarding the supposed connection of disease of the sympathetic nerves to exophthalmic goitre naturally leads to the opinion that operations directed to the sympathetic system are based upon a poor foundation. Nevertheless, favorable reports are not wanting in the literature. Thus Jeunet,¹ when considering the indications for operation in exophthalmic goitre by section of the sympathetic of the neck, states that if other methods of treatment have been used without success, and particularly if the exophthalmos is marked, this operation should be undertaken. The effect is usually seen especially in a reduction of the protuberance of the eyes. He notes the advisability of using ether rather than chloroform, and of practising the resection of the nerve on one side at one operation, and then resecting the other after an interval of two or three days.

H. Bled,² in comparing the question of operation upon the sympathetics in exophthalmic goitre, concludes that there are a certain number of symptoms which are wholly likely to be improved as the result of surgical intervention, and that they do not usually return. The fatal results that have followed this operation, however, should teach one to approach it with diffidence, and to look with suspicion upon its too-optimistic recommendations that have come from some sources, particularly from the school at Lyons.

THE USE OF THYROID EXTRACT OR THYROIDIN. As far as the treatment with thyroid extract or thyroidin is concerned, physicians of experience are agreed that the results vary greatly. This may be due to the fact that there is a variation in the secretory power of the gland in different patients, and that sometimes Basedow's disease results from increased secretion, and other times from altered secretion.

IODOTHYRIN. Weiller³ reports a case of exophthalmic goitre in a woman thirty-nine years of age, in which entire recovery seemed to ensue on the administration of iodothyryn in a dose of 25 cgm. taken once at first, then twice, and later three times a day. The treatment was begun on February 17th and was stopped on May 7th. At that time the exophthalmos had disappeared, and the patient could follow her occupation without fatigue. The pulse had fallen from 104 to 84; there was still slight tremor, and the goitre had not changed in volume or in consistency. Two months later, in July, the improvement still persisted.

EXTRACT OF THYMUS. R. Parker⁴ has treated four cases of exophthalmic goitre with extract of thymus. In the first case, in spite of continuance of the treatment over six months, there was no change in

¹ Thèse de Paris, 1897-1898.

² Loc. cit.

³ La Presse Médicale, August 27, 1898.

⁴ British Medical Journal, January 7, 1899.

the symptoms. The second case improved in general symptoms, though the goitre did not decrease in size. There had been some improvement in this case, spontaneously, five years before this treatment. The third case had improved markedly upon digitalis and quinine, and seemed to improve considerably upon the thymus, though the pulse remained very rapid. In the fourth case there was improvement after omitting the treatment with thymus, but it is believed that the gland was effective.

STRONTIUM BROMIDE AND IODIDE. A. Lockhart Gillespie¹ reports that the use of strontium bromide and iodide in the treatment of exophthalmic goitre in children has given him very satisfactory results, the swelling of the gland decreasing rapidly, and the pulsation disappearing; the tension of the pulse became more marked at the same time that its force and the rapidity of the heart-action were lessened. The dyspnoea disappeared, and the eyeballs became less prominent. Gillespie used the strontium salts because the effects did not seem to be so unpleasant, and it was thought possible that a metal not normally present in the body in appreciable amounts might have more notable effect upon abnormal conditions than other metals which are already present in large quantities. Cases of exophthalmic goitre in children under fifteen years of age have been much commoner among females than among males. There are about thirty-six on record.

ODOFORM INJECTIONS. Pitres, in discussing Armaignac's case, previously referred to, stated that his experience indicated to him that excellent results were to be expected in the treatment of this condition if it were not far advanced. Hydrotherapy, in particular, seemed to give marvellous results in certain cases; in more advanced cases medical treatment seemed of little value. He had recently, however, used injections of iodoform for the purpose of causing contraction of the thyroid, introducing this substance directly into the thyroid body. His results seemed to be good; the gland diminished in size, and although entire recovery of health did not ensue, there was distinct general amelioration. He believes that injections are without danger.

Davezac² reports a case of exophthalmic goitre which he treated by the method of Petris, with injections of iodoform-ether into the thyroid. He notes that the injections are very painful, and that a peculiar ballooning of the tissues frequently occurs, leading one to think sometimes that he has injected air. The result in Davezac's case was extremely favorable; the circumference of the neck diminished, the exophthalmos decreased, and the insomnia disappeared.

¹ British Medical Journal, October 8, 1898.

² Gaz. Hebdom. de Méd. et de Chir., November 24, 1898.

OPHTHALMOLOGY.

By EDWARD JACKSON, M.D.

Introductory. In his address as chairman of the Section on Ophthalmology of the British Medical Association, for the meeting of 1898, Argyll Robertson said: "During the twelve months that have elapsed since the last meeting of the Association no startling novelty or important advance in our department of medical science has, as far as I am aware, been communicated to the profession. Ophthalmology, indeed, seems to have attained such a development that a short time may probably elapse ere any further important advance is made. In fact, it is advisable occasionally to rest in that constant strain after novelties, and to consolidate, strengthen, and perfect the advances that have already been made." Thus the testing and confirmation of discoveries previously announced has been the work of the past year, and in many directions it has been most profitable.

DISEASES OF THE CONJUNCTIVA.

Bacteriology. But a few years since the inflammations of the conjunctiva were classified entirely by gross clinical characteristics, and were supposed to be caused by non-specific irritants and by obscure conditions of the conjunctiva itself, or of the general system. This is all being changed with a rapidity almost alarming to the student of ophthalmology who tries to keep fully abreast of the latest developments in this science. At least five specific inflammations of the conjunctiva have been positively connected with the bacteria which cause them. Large numbers of cases, including important clinical groups, have not been so connected, however, and must still be dealt with under the old system of classification. The necessary confusion arising from this transition state is increased by the fact that the newly identified diseases do not conform exactly to the old clinical types. Thus, we have not found one form of bacteria causing the typical acute catarrhal conjunctivitis, and another present in all cases of ophthalmia neonatorum, but the Koch-Weeks bacillus causes certain conditions which we formerly classed as acute catarrhal conjunctivitis, the pneumococcus causes other conditions, and others still are evidently not due to either of these organisms.

The apparent incongruity of the new classification with the old has

undoubtedly been greatly increased by observers imperfectly trained in bacteriology confusing different organisms, and so reporting a certain one present in diverse clinical types when this was not really the case, as has been done with the Klebs-Loeffler diphtheria bacillus, and the so-called xerosis bacillus, to be referred to presently. I would emphasize the remarks of McFarland and Kneass:¹ "It is deplorable that so many ophthalmologists have hurried into the bacteriological study of cases with so incomplete a knowledge of the subject as to render their work not only valueless, but, worse than that, an obstacle in the way of others."

The normal conjunctiva practically always contains some bacteria, although the lachrymal secretion has a distinctly bactericidal action, and a single test may not show any. As various observers have pointed out, the loop from which the inoculation is made comes in contact with only a small part of the membrane, yet 87 out of Randolph's 100 inoculations gave colonies of bacteria, although the culture medium he used, nutrient agar, is not favorable to the development of all the forms commonly found in the conjunctival sac. Still the number of bacteria found in the normal conjunctiva is comparatively small, and these are usually but feebly, or not at all, pathogenic. It has been agreed by all observers that germs are much less numerous in the upper than in the lower cul-de-sac, a fact which bears directly upon the placing of corneal or scleral incisions in operations on the eyeball.

In a study of 200 cases² Arnold Lawson found 41 of his tubes sterile and 159 fertile. Among the latter 118 contained the so-called xerosis bacillus, 90 in pure culture. He believes this bacillus has heretofore been generally overlooked because of the difficulty of growing it upon any medium except blood-serum, and as it is found in as large numbers in the healthy conjunctiva as in cases of xerosis, Lawson reasonably argues that it has no connection with that disease. In this view he agrees entirely with Hans Heinersdorf,³ who found it in 41 healthy conjunctival sacs out of 51 examined, and with Axenfeld⁴ and Gifford.⁵ Its importance may be appreciated when it is understood that Sydney Stephenson reported to the Ophthalmological Society of the United Kingdom,⁶ that among 6209 children he found 1.87 per cent. affected with "epithelial xerosis of the conjunctiva," the proportion in one place reaching almost 10 per cent. (See also Diphtheria of the Conjunctiva.)

Gonococcus Infection. The discovery of the gonococci as the cause of gonorrhœa was at once followed by its acceptance as the cause of gon-

¹ System of Diseases of the Eye, edited by Norris and Oliver.

² British Medical Journal, August 20, 1898.

³ Gräfe's Archiv für Ophthalmol., vol. xlv. 1.

⁴ Berliner klin. Wochenschrift, February 10, 1898.

⁵ Archives of Ophthalmology, November, 1898.

⁶ Ophthalmic Review, February, 1898.

orrhoeal ophthalmia, and its presence in the secretions has been demonstrated whenever it has been sought. Recourse to the microscope in the diagnosis of this disease has not become the general rule, however, and papers urging its importance are timely. A plea for its more general use is made by A. B. Kibbe,¹ who cites a case in which the symptoms were obscure, and the history of injury and irritation by smoke would have been entirely misleading; another in which a man with gonorrhoea was relieved of the fear excited by a simple conjunctivitis, and a third, in which a suit for malpractice was prevented by the patient knowing that he would be confronted by a microscopic preparation revealing the real character of his disease. H. Knapp reinforces Kibbe's plea² by the publication of two cases of his own. Both were atypical and obscure. In one the eye was lost, when it might have been saved, Knapp thinks, had a bacteriological examination been made at the first visit. In the other the bacteriological test relieved the patient from unjust suspicion, awakened by the appearance of the eyes, and the subsequent course of the case to recovery confirmed the findings with the microscope.

In the ophthalmia of the new-born, while the microscopic examination of the discharge proves that the great majority of cases, including those which are typical and severe, are due to the gonococcus, it is found that cases also occur which are not of this nature, and that nothing but bacteriological examination can be relied upon to discriminate between the two. Allen Greenwood,³ in three cases, found the gonococcus in each, but Groenouw reported⁴ that among 40 cases studied by him the gonococcus was found in but 14, and in pure culture but once, and these fourteen included the more typical cases. In discussing Groenouw's paper, Leber urged that although mixed infection occurred, the gonococcus was the essential cause of blennorrhoea neonatorum. Schmit-Rimpler and Bach maintained that the disease could occur without gonococci. Evidently there are cases in which a positive diagnosis cannot be based on the clinical features alone. The safe course is to treat the case as due to the gonococcus, but to speak of it as having such a cause only when the organism has been identified by bacteriological examination.

Diphtheria of the Conjunctiva. That the Klebs-Loeffler bacillus may cause the condition heretofore recognized as diphtheritic conjunctivitis is now well established, but in some cases there is certainly a mixed infection, and it is possible that the condition is sometimes due to streptococcus infection alone. Uncertainty has also arisen from numerous reports of the finding of the diphtheria bacilli in cases which pre-

¹ Archives of Ophthalmology, July, 1898.

² Loc. cit.

³ Ophthalmic Record, March, 1898.

⁴ Heidelberg Ophthalmic Congress, 1898.

sented none of the classic symptoms of the disease in question, but appeared in all other respects much less serious. Finally, the confusion is greatly increased by the grave doubt as to whether Klebs-Loeffler bacilli were found in these cases, or how often they were so found, by the fact that the reports fail to give any evidence that sufficient care was taken to identify the bacilli observed, leaving the suspicion that they might with equal probability have been the pseudo-diphtheria bacilli of Hoffman, or the xerosis bacilli which Lawson so generally found in the normal conjunctiva.

Some of the best bacteriological work of the year has been devoted to establishing the relationship of these forms and to discriminating between them, but the results are not yet very definite or satisfactory, so that we must still take reports of the frequency of atypical diphtheritic disease of the conjunctiva *cum grano salis*.

Sydney Stephenson¹ bases identification of the diphtheria and xerosis bacilli on the following points: Both stain by Gram's method, but when placed in alcohol the diphtheria organism loses its gentian-violet much more quickly than the "xerosis" bacillus. The diphtheria bacilli grown in neutral bouillon or milk give rise to an acid reaction; the others do not. Inoculated into guinea-pigs, the "xerosis" bacilli cause only swelling at the point of puncture. Heinsdorf believes that the "xerosis" bacillus represents a group resembling the diphtheria bacillus, but that it is harmless. He calls attention to twelve different points in appearance, staining, and growth on different media, to be noticed in attempting to discriminate between them, but concludes that the only absolute test is by inoculation experiments on animals. The xerosis bacilli may be called pseudo-diphtheritic bacilli, but that term has been applied to Hoffman's bacillus, found in the throat, which is not, he thinks, identical with this bacillus of the conjunctiva. Axenfeld² obtained from the conjunctiva in four cases colonies resembling the Hoffman bacillus, but he could not obtain the one form from the other, and thinks they represent two forms of one family. Franke³ found that "xerosis" bacilli grew more abundantly on blood-serum and peptone-agar, decolorized when stained by Neisser's method, and caused an alkaline reaction in bouillon; the Hoffman pseudo-diphtheria bacilli grew less abundantly on blood-serum and peptone-agar, decolorized by Neisser's method, and did not alter the reaction of bouillon; the diphtheria bacilli retained their color by the Neisser method, in bouillon always caused an acid reaction, and were pathogenic on inoculation, while the others were not.

Until other and more conclusive tests are forthcoming the practitioner,

¹ British Medical Journal, June 6, 1898.

² Berliner klin. Wochenschrift, February 28, 1898.

³ Münchener med. Wochenschrift, April 19, 1898.

unable to test the pathogenic character of the bacilli upon the guinea-pig, will have to be guided somewhat by the pathogenic effects on the eye in which they are found and by the influence exerted by injections of diphtheria antitoxin. It is now well established that true diphtheria of the conjunctiva is quickly checked by the antitoxin injection, but it may require repetition at intervals of twelve to twenty-four hours to bring about a complete cure.

In *streptococcus diphtheria* of the conjunctiva, as in streptococcus infection of the throat, the symptoms may resemble closely those of true diphtheria, but the antitoxin produces no decided effect. Mixed infections have been reported, and are, perhaps, more frequent than pure infection by Klebs-Loeffler bacilli. R. N. Keely¹ reports a case in which streptococcus infection occurred by extension from the nose.

Acute Contagious Conjunctivitis caused by the Koch-Weeks bacillus is characterized by features which make the typical case easily recognizable clinically. These features are the marked pink of the ocular conjunctiva, the abundant yellowish discharge drying on the lashes, and its epidemic occurrence. The bacillus, as thick as the tubercle bacillus, but shorter, stains readily and develops freely in 0.5 per cent. agar, but it cannot usually be obtained in pure cultures, on account of its close association with a larger club-shaped bacillus which is not pathogenic. I have seen nothing during the past year which cast any doubt upon the reality of its connection with the disease which Weeks proved to be caused by it.

Diplobacillus Conjunctivitis. In 1896 Morax and, independently, Axenfeld, announced the connection of a diplobacillus with certain cases of conjunctivitis. The bacillus stains readily and is decolorized by Gram's method. It grows upon blood-serum, but not on potato, gelatin, agar, milk, or bouillon unless serum is added. Within the past year numerous observers have confirmed the more important statements of the discoverers. H. Gifford² reports upon ten cases in which he found the organism and studied it in cultures, and upon the production of the disease by inoculation of a serum culture of the third generation upon his own eye. A. Alt³ has studied it in three cases of pure infection. G. J. Schoute⁴ reports a case. Holden and de Schweinitz and Veasey have each encountered it in connection with corneal ulcers, and W. M. Sweet⁵ found it in seven out of thirty-two cases of conjunctival and corneal disease. J. W. Eyre found it in 2.5 per cent. of the new cases of

¹ Journal American Medical Association, March 5, 1898.

² Annals of Ophthalmology, April, 1898.

³ American Journal of Ophthalmology, June, 1898.

⁴ Berliner klin. Wochenschrift, April 18, 1898.

⁵ Ophthalmic Record, February, 1899.

eye disease applying at Guy's Hospital,¹ and that it was most common among middle-aged women.

Morax characterized the conjunctivitis caused by this organism as being subacute and very insidious. Axenfeld called it chronic, but later reported that he had seen cases which began with marked swelling of the lids and redness of the conjunctiva. Alt's cases were all acute. Most of the cases of corneal ulcer reported in connection with it were mild, but Axenfeld and Gifford each met with one which promised malignancy.

TREATMENT. Morax and Axenfeld laid stress upon the rapid improvement of the disease under instillations of solutions of zinc sulphate when other treatment had been of no benefit. Sweet had the same experience. Gifford found a single instillation of a solution of zinc chloride, 0.2 per cent. (one grain to the fluid ounce), gave prompt relief, but the symptoms returned after several days, and four or five applications were required to effect a cure. Eyre also found the zinc salts of especial value. Schoute reports that rapid improvement occurred under the local application of silver nitrate and a solution of mercuric chloride. Alt effected a cure in twelve or fifteen days by daily applications of a 1 per cent. solution of protargol.

Pneumococcus Conjunctivitis. An acute conjunctivitis, sometimes quite purulent, is caused by the pneumococcus of Fraenkel (*diplococcus lanceolatus*). Axenfeld² gives a case in which it coexisted with urethral gonorrhœa, but quickly healed. But this organism is of more serious importance in connection with corneal ulcers. It is probable that the frequent acute epidemics of ophthalmia which Greef³ points out have nothing to do with trachoma and are comparatively mild and self-limited, are chiefly of pneumococcus conjunctivitis and of the form due to the Koch-Weeks bacillus.

Trachoma, having many of the characteristics of specific contagious disease, has been an inviting field for the ophthalmic bacteriologist, but investigators from Koch down have found it to yield most contradictory and unsatisfactory results. Arnold Lawson,⁴ from a review of the bacteriological history of the disease and personal observations, is favorably inclined toward a theory of mixed infection, although he admits it must rest for the present on a hypothetical basis. McFarland and Kneass characterize the situation by saying: "It would scarcely be possible for one to describe an organism characteristic of trachoma, at the present time, without the danger of an accusation of plagiarism, for every pos-

¹ British Medical Journal, August 20, 1898.

² Deutsche med. Wochenschrift, November 3, 1898.

³ Berliner klin. Wochenschrift, May 16, 1898.

⁴ Royal London Ophthal. Hosp. Rep., vol. xiv., Part III.

sible organism has already been described by some one of these enthusiasts."

Nevertheless, E. F. Snyderaker¹ cuts the knot by reporting a study of the subject which seems largely to reconcile the contradictions of his predecessors or to indicate the sources of their errors. He finds that the organism of trachoma is a tiny capsulated diplococcus, which is present in the trachoma nodule, and at times, though not frequently, in the secretions. It changes its form on different culture media, and also its size, and is obtained in culture with great difficulty. It dies in liquid culture media in about two weeks, but lives for months on solid media. It is smaller than the pneumococcus, has slight motility, and differs entirely from the pneumococcus in pathogenesis and appearance on culture media.

The bulk of previous observations point toward a coccus as the cause of trachoma. Snyderaker believes that Sattler (1881) and Michel (1886) saw this organism; but they failed so to characterize and individualize it that others could confirm their observations. Koch judged trachoma to be a mixed infection, because he found a diplococcus and a tiny bacillus. Kukharski observed a bacillus which somehow became a coccus. Snyderaker finds that the septum between the cocci sometimes stains so that the diplococcus cannot be distinguished from a tiny bacillus. Schmidt and Baumgarten described a staphylococcus. Snyderaker finds that on solid media the grouping of the diplococci closely simulates staphylococci, so closely that in his first cultures he was chagrined to find an organism that seemed to differ in no wise from an ordinary staphylococcus.

Some observers have sought the organism chiefly in the conjunctival secretions, and have reached most contradictory results. Snyderaker found it in the secretion in only four of thirteen cases, and found it easily only in two cases that had not been subjected to treatment.

To find the organism it is necessary to squeeze out the contents of a follicle, smear on a cover-glass, fix in a flame, and stain by Gram's method. From its cultures a toxin was obtained which killed the guinea-pig, but if the animal were treated with increasing doses it received double the lethal dose without other symptoms than a temperature reaction. Snyderaker's work brings an appearance of order in what has been one of the worst regions of bacteriologic chaos, and his clear and simple directions for finding the organism can readily be put to the test.

Alt, who has been studying the histopathology of trachoma by the aid of the methods of differential staining now employed in blood examinations,² has been struck with the frequency of "an immense cell with a large pale nucleus, in the protoplasm of which were embedded smaller

¹ Journal American Medical Association, February 4, 1899.

² American Journal of Ophthalmology, April, 1898.

and larger bodies which were in part very deeply stained." He thinks these may be the trachoma parasite, although they are the same as were described by Leber, who found them also in the lymph follicles of the rabbit's conjunctiva.

Parinaud's Conjunctivitis. In 1889 Parinaud called attention to a form of conjunctivitis characterized by sudden onset, great thickening of the lids, muco-purulent discharge which soon becomes scanty, large pedunculated or polypoid granulations, with smaller granulations and erosions or small ulcerations between, and early and severe involvement of the lymph-glands related to the affected eye, which in several cases have gone on to suppuration.

Gifford¹ reports five cases of this disease. When the granulations are large he finds the best treatment is to clip them off and cauterize the ulcerations. Crystals of copper sulphate also seemed to do some good, but in the worst cases improvement is slow, and all sorts of remedies have produced good results in the end. Gifford finds no good reason to think the disease is of animal origin, as Parinaud supposed. An additional case is reported by F. W. Miller.²

Treatment. The bacteriological differentiation of forms of conjunctivitis has not led to an equal differentiation of specific treatment, although something is being done in this direction.

For conjunctivitis due to the *Klebs-Loeffler bacillus* the employment of *diphtheria antitoxin* has changed the prognosis from extremely grave to very favorable. Thus, W. H. Gregory³ reports the case of a young man who suffered from diphtheria of the conjunctiva, nares, throat, and urethra, and who recovered very promptly under the use of antitoxin, three injections being employed.

For *streptococcus infection* Knapp has suggested the use of frequent instillations of a 2 per cent. solution of *potassium chlorate*. Veasey⁴ found this efficient where the collyria more commonly employed had all proved ineffective.

The *diplococcus conjunctivitis* of Morax and Axenfeld has reinstated solutions of *zinc sulphate* of 0.5 to 2 per cent. in the list of collyria frequently employed; although, as already indicated, it is not certain that they possess a great advantage over other remedies for this affection.

Vernal conjunctivitis has proved a most intractable affection, recurring year after year with the warm weather and in spite of all sorts of treatment, only getting better when cooler weather comes, and sometimes continuing troublesome for years. R. L. Randolph reports⁵ that the

¹ American Journal of Ophthalmology, July, 1898.

² Ophthalmic Record, October, 1898.

³ British Medical Journal, September 17, 1898.

⁴ Ophthalmic Record, February, 1899.

⁵ British Medical Journal, January 8, 1898.

symptoms were dissipated in moderate cases by rubbing into the conjunctiva once or twice daily an ointment of *salicylic acid*, six or eight grains to the ounce of lanolin. In one case in which the inner surface of the lids was covered with broad, flat, cartilaginous nodules, an ointment containing 75 grains to the ounce was applied to the everted lids daily, with the result that the granules were almost removed in a month. The applications should be made by the physician himself and under local anæsthesia.

PROTARGOL, ARGENTAMINE, AND ARGONIN. The most striking innovation in the treatment of conjunctivitis in the past year has been the introduction of protargol, a fine yellow powder, soluble in water and containing 8.3 per cent. of silver combined with a protein substance. Argentamine, an amido-compound of silver, and argonin, a compound of silver with casein, have also been put forward for the same purpose, as substitutes for silver nitrate, but so far have not received so general a trial or such decided commendation. These drugs are all less irritant than silver nitrate, and are claimed to be equally efficacious antiseptics, especially in the treatment of purulent conjunctivitis. The claims of the first mentioned are worth careful consideration.

Protargol was suggested as the best silver salt for the treatment of gonorrhœa by Neisser¹ in October, 1897. Alt, after two months' use of it, reported² that it was painless and acted as well as silver nitrate. He used a 1 per cent. solution in all conjunctival inflammations for which he had before used the silver nitrate. Darier³ found argentamine had a stronger antiseptic action than silver nitrate when employed against the gonococcus, and more penetrating power, while its application was less painful, but he found protargol as strong or even stronger, absolutely harmless, producing very slight irritation. In purulent conjunctivitis he applied to the everted lids 20 to 50 per cent. solutions of protargol, as often as twice a day, and as a collyrium prescribed solutions of from 2 to 5 per cent.

Deneffe⁴ found that applications of a 5 per cent. solution of protargol to the inflamed conjunctiva were painless. In every form of conjunctivitis he found it equally efficient and more pleasant in its action than silver nitrate. Pergens,⁵ for ophthalmia neonatorum, used a 12 per cent. solution of protargol every hour, and healing occurred in six to thirteen days. In chronic blennorrhœa of the conjunctiva the results were less favorable. Wicherkiewicz⁶ regards protargol as the sovereign

¹ Dermatol. Centralbl., October, 1897.

² American Journal of Ophthalmology, January, 1898.

³ La Clin. Ophthalmologique, January 10, 1898.

⁴ Bull. de l'Acad. Roy. de Méd. de Belgique, February 26, 1898.

⁵ Klin. Monatsbl. f. Prakt. Augenheilk., April, 1898.

⁶ Ophthalmol. Klinik, November 5, 1898.

remedy for purulent conjunctivitis. After thoroughly cleansing the conjunctival sac with boric-acid solution, he mopped the everted lids with cotton soaked in a 20 per cent. solution, and had a 1 per cent. solution instilled by the attendant every two hours.

F. E. Cheyney¹ has tried protargol in 130 cases of conjunctival disease, including 25 cases of ophthalmia neonatorum. In 10 of the latter he used protargol in 2 to 4 per cent. solution in one eye, and silver nitrate in 1 to 2 per cent. solution in the other. He concludes that the new drug possesses "all of the advantages of silver nitrate and none of its disadvantages." It produces almost no irritation, and does not stain the skin.

E. S. Peek, in a report upon protargol and argonin,² finds these drugs superior to silver nitrate in that they cause the quicker destruction of the gonococcus, the earlier disappearance of the secretion and the inflammatory process, and the resolution of the injured corneal and conjunctival tissues. Protargol is the more painful, but its more prompt germicidal action and the greater stability and easier preparation of its solution commend it.

Pflueger, who reported unfavorably upon protargol,³ had used it in only one case of ophthalmia neonatorum, and in a one-fourth of 1 per cent. solution. O. Walter⁴ used it as advised by Darier, and found protargol not superior to silver nitrate, but even inferior to it, either in blennorrhœa, trachoma, or muco-purulent conjunctivitis. G. M. Black,⁵ after three months' use of it, is not satisfied that protargol is a complete substitute for silver nitrate.

Protargol has also been reported as an efficient prophylactic for ophthalmia neonatorum, by Fuerst,⁶ who uses it in 10 per cent. solution, and by Darier. Fryer⁷ has used it to antisepticize the conjunctiva prior to operations. He used a 2 per cent. solution and found it rendered the conjunctiva aseptic much sooner than sublimate solutions, and without any irritation.

On the whole, the testimony regarding protargol is such that the prudent practitioner is fully justified in giving it a trial, and thus saving his patient from the pain and discomfort caused by silver nitrate, especially since its efficacy is best attested in conjunctival blennorrhœa, the most immediately dangerous condition for which silver nitrate has been commonly used.

¹ Boston Medical and Surgical Journal, August 25, 1898.

² Medical News, January 21, 1899.

³ La Clin. Ophthalmologique, July 10, 1898.

⁴ Ophthalmol. Klinik, July 5, 1898.

⁵ Ophthalmic Record, October, 1898.

⁶ Fortschritte f. Innere Medicin, No. 4, 1898.

⁷ Trans. of the American Ophthalmological Society, 1898.

POTASSIUM PERMANGANATE solution was proposed for purulent conjunctivitis and has found favor with many surgeons. Leber¹ gives it the preference for gonorrhoeal conjunctivitis in the adult, although he prefers silver nitrate and cold applications for ophthalmia neonatorum. He uses a solution containing :

Potassium permanganate	1.	gr. xv.
Sodium chloride	7.5	ʒij.
Water	1000.	Oij.

With this the eye is irrigated three times a day or more frequently.

Removal of Tarsus and Retrotarsal Fold for Trachoma. This operation, proposed fifteen years ago and used by some European operators extensively, has recently been tried by Casey Wood, who reports its use in fourteen cases with the best results.² He employs it in chronic cases showing trachomatous infiltration of the retrotarsal folds and thickening and enlargement of the tarsus. He does not advise it in the early stages, or when the deposits are scattered so that they can be removed one by one, or when there has been cicatricial shrinking of the conjunctival sac:

FIG. 47.



After KUHN.

FIG. 48.



After KUHN.

Although the operation is performed by the Germans under local anaesthesia with cocaine, Wood finds it sufficiently painful to demand a general anaesthetic. The upper lid is everted, the convex margin of the tarsus grasped with forceps, and the whole everted lid turned out and drawn up by an assistant. An incision is made along the dotted line (Fig. 47). Three stitches of soft silk are passed so that each includes

¹ Bericht u. die xxvi., Versammlung der Ophthalmol. Gesells. zu Heidelberg.

² Annals of Ophthalmology, July, 1898.

only about 1 mm. of the bulbar margin of the conjunctiva, which is then undermined for about 5 mm. The lid is now turned down and held everted upon a lid-spatula, and a second incision made along the dotted line shown in Fig. 48, the two incisions coming together at their ends, and including the area of diseased tissue. This tissue is then seized and excised with scalpel and scissors, care being taken to avoid the orbicularis and Mueller's muscle. The sutures are then carefully passed through the tarsal margin of the conjunctiva, so as to bring corresponding points accurately together. When bleeding has ceased the stitches are tied after making sure that they have been properly placed and allow of the proper movements of the eye and lids. Both eyes are bandaged and the patient is kept quiet. The stitches are removed on the fourth or fifth day.

Wood denies that simpler methods answer the required ends, or that the tarsal incision makes matters worse. He believes that the tissue destruction brought about by the chronic trachoma is greatly lessened by the operation, but it would seem that the trachomatous process will rarely be so localized as to admit of complete extirpation by such an operation, which must always destroy parts of the lid tissue, especially its epithelial lining, which would not be sacrificed by the most thorough expression of the trachoma granules by some form of trachoma forceps.

Pterygium. For the treatment of pterygium of moderate size, Starkey¹ urges the advantages of the galvanic current: It avoids loss of tissue, is painless, does not incapacitate the patient, and stops the growth in the early stages. An operation that possesses these advantages is probably better for the patient than the advice to let a small pterygium alone, although in most cases it never causes serious trouble. Starkey uses a current of from 1 to 3 milliamperes, passed through a platinum needle connected with the positive pole of the battery, and introduced through and beneath the pterygium and close to the sclera near the apex of the growth, the eye being previously cocaineized. The circuit is completed by the negative electrode of wet sponge held in the hand, and the current is maintained for one or two minutes. A second puncture should be made parallel with the first, and 2 mm. distant, toward the canthus, and a third similar puncture may be made if desirable. The treatment may be repeated after four or five days or after as many weeks. It is not advised for fleshy growths or those encroaching much on the cornea.

For the larger growths, as Henry Lopez says, after a review of the many operations that have been tried,² "the method of extirpation is the most rational one." Lopez uses no suture and dissects the conjunctiva back somewhat from the cornea, believing that to prevent recurrence

¹ Journal of the American Medical Association, September 17, 1898.

² Archives of Ophthalmology, May, 1898.

the conjunctiva must be kept away until the corneal epithelium has re-formed.

EPITHELIAL GRAFTS OF MUCOUS MEMBRANE. Excision and covering the raw surface with a graft is probably the best treatment for very large pterygia. In doing this, epithelial grafts from the skin, "Thiersch grafts," have often been used, but they remain slightly different in appearance from the conjunctiva, and to that extent noticeable. Epithelial grafts cut from the inner surface of the lip are cosmetically superior. Hotz has recently employed such a graft¹ in the case of an epithelioma removed from the usual position of a pterygium. The graft obtained was too narrow to cover the whole denuded surface, so he placed it with its length parallel with the corneal margin and a little back from it, because he had noticed that the graft was liable to be slightly displaced on to the cornea by the movements of the globe, if laid just at the margin. The ends of the graft were fastened with fine sutures. The graft was cut quite as an ordinary Thiersch graft, the mucous membrane being put on the stretch with an ordinary lid-forceps with the open ring blade on the inner surface of the lip. Gifford, who has strongly urged the value of these grafts of mucous membrane from the lip, has devised a special clamp for use in cutting them.²

Tumors of the Conjunctiva. GUMMA of the conjunctiva is rare. It is sometimes extremely rebellious to treatment, and may readily be mistaken for carcinoma. C. D. Marshall³ reports a case examined microscopically, the eye having been removed for glaucoma following hemorrhagic retinitis. A Barkan, commenting on a case under his care,⁴ taking 20 grain doses of potassium iodide, stated that his experience led him to believe there was no advantage in larger doses. This is not the experience of others, although the cases in which larger doses are essential are unusual.

LYMPHANGIECTASIA. Alt reports⁵ an unusual case in which the lymph spaces suddenly became dilated, forming almost a ring around the cornea. At first the contained fluid was the color of blood, but in a few days it became only slightly yellowish. This has been noted in other reported cases. Alt's explanation is that there must have been a hemorrhage which spread only in these lymph vessels.

CYSTS. Closely allied to lymphangiectasia are some of the *serous cysts* of the conjunctiva. One is reported by Snell,⁶ the size of a hazelnut, slowly growing since childhood. It was lined by a single layer of endothelial cells.

¹ Journal of the American Medical Association, October 1, 1898.

² Ophthalmic Record, December, 1897.

³ Loc. cit., 1898.

⁴ Ophthalmic Record, February, 1899.

⁵ American Journal of Ophthalmology, February, 1898.

⁶ Ophthalmic Review, July, 1898.

A. Schapring reports¹ on a translucent, rounded, slightly yellowish tumor, the size of a split pea, half-way between the lower part of the cornea and caruncle, that had grown in six months, without previous traumatism, in a healthy girl of nineteen years. He calls it a *benign cystic epithelioma* of the conjunctiva on account of its close histological resemblance to benign cystic epithelioma of the skin. He has found no description of such a tumor of the conjunctiva, but regards it as due to a pathological process, a modification or later stage of which gives rise to simple serous cyst. Such cysts are readily extirpated and rarely recur.

CARCINOMA OF THE CARUNCLE. G. E. de Schweinitz² reports a tumor the size of a pea, removed from a healthy man, aged fifty-two years. It had been noticed a number of years, and had recently begun to grow and cause irritation. He points out that the structure was not typically epitheliomatous, but the tumor might with propriety be classed as an endothelioma, and that malignancy does not always pertain to small epithelial tumors growing from mucous membranes or from muco-cutaneous surfaces.

PRIMARY CARCINOMA, springing from the limbus and overhanging the cornea, and involving the retrotarsal fold but not extending into the cornea or sclera, is reported by C. D. Wescott.³ It had been noticed for two or three years. Hotz⁴ removed an epithelioma from the limbus of a young man. It extended slightly upon the cornea.

SPINDLE-CELL SARCOMA. S. B. St. John⁵ reports a case which sprang from the margin of the conjunctiva and overlapped the cornea. It had grown to the size of a large pea in six weeks. It was removed without seriously disturbing the eye, which had normal vision, while the other eye was blind from accident.

Wintersteiner points out⁶ that sarcoma originates in the part of the conjunctiva exposed in the palpebral fissure in the great majority of cases—133 out of 160. This he explains by the fact that the growth follows injury, or proceeds from the degeneration of pigment spots in this situation, while in other parts of the conjunctiva these spots remain unchanged. C. D. Marshall⁷ reports a case originating in injury from a spark from a lamp five years previously.

MELANO-SARCOMA. A case of *melano-sarcoma* of the conjunctiva extending on to the cornea is reported by Green and Ewing,⁸ in which the patient had noticed a spot about 4 mm. in diameter twenty-five

¹ New York Eye and Ear Infirmary Reports, January, 1898.

² Transactions of the American Ophthalmological Society, 1898.

³ American Journal of Ophthalmology, September, 1898.

⁴ Journal of the American Medical Association, October 1, 1898.

⁵ Transactions of the American Ophthalmological Society, 1898.

⁶ Bericht u. d. xxvii. Versamml. der Ophthal. Gesellsch. zu Heidelberg.

⁷ Journal of Eye, Ear, and Throat Diseases, July, 1898.

⁸ Transactions of the American Ophthalmological Society, 1898.

years before, and nine years before the growth was noticed to have become somewhat prominent, so that it could be felt through the upper eyelid. It was composed of both spindle and round cells.

DISEASES OF THE CORNEA.

Corneal Ulcer. FLUORESCIN. The existence of a defect in the corneal epithelium, or the exact extent of its destruction, is often somewhat difficult to recognize, and a solution of fluorescin, therefore, which gives the whole surface of the ulcer a distinct green color, is often useful. J. Fallows¹ points out that this aid is often desirable where it is not only inconvenient to carry solutions, but also difficult to keep them sterile. He has employed, therefore, tabloids containing one two-thousandth of a grain of fluorescin and one one-thousandth of a grain of sodium bicarbonate, with one of which a solution can be made extemporaneously.

TOLUIDIN-BLUE. C. A. Veasey² calls attention to the fact that toluidin-blue stains corneal abrasions and ulcers a dark blue, rendering them quite as evident as fluorescin. At the same time toluidin-blue hastens materially the healing of sluggish ulcers and diminishes the discharge from conjunctivitis. In solutions of 1 to 50 the drug is not irritating, but 1 to 1000 seemed as effective as stronger solutions.

Serpent or Pneumococcus Ulcer. The creeping or serpiginous ulcer which tends to spread by a margin of infiltration and with an overhanging edge, constitutes an extremely grave form of corneal disease.

Holden³ reports the results of a microscopic study of such a case. There was considerable hypopyon present, and the specimen illustrated the truth of Leber's view, of which Holden had convinced himself by experiments, that in hypopyon the deposit in the anterior chamber comes not from the cornea, but from the deeper vessels of the globe. The only micro-organism found was the diplococcus lanceolatus, the pneumococcus of Fraenkel. The colonies on the surface of the ulcer did not take the stain well, showing that their vitality had been destroyed by treatment (touching the ulcer with tincture of iodine once or twice a day, and cauterizing points of marked infiltration), but the deeper colonies stained well and may have grown after the patient's death. They had pushed into the lymph-spaces for considerable distances without departing from the plane in which they had entered the cornea from the margins of the ulcer, thus showing why such an ulcer tends to spread

¹ British Medical Journal, August 20, 1898.

² Philadelphia Medical Journal, August 13, 1898.

³ Archives of Ophthalmology, March, 1898.

laterally and should have steep or overhanging margins. There was nothing to show that the organisms were carried by leucocytes or lymph currents into the sound tissue, their presence there being due, seemingly, to direct extension of the colonies.

The view that this form of corneal ulcer is due to the pneumococcus has been confirmed by many observers, and Gifford¹ holds to his opinion, expressed two years earlier, that in the vicinity of Omaha this germ is by far the most frequent cause of acute catarrhal conjunctivitis.

Hypopyon Keratitis. In a case of hypopyon keratitis, apparently a deep and not serpiginous ulcer, studied histologically but not bacteriologically by John Green and A. E. Ewing,² the posterior limiting membrane was found separated from the cornea by a mass of pus extending through breaks in the membrane, and becoming continuous with the pus in the anterior chamber. They found no evidence of recent inflammatory activity about the periphery of the cornea or iris. The angle of the anterior chamber had been closed by glaucoma, from which the patient had been blind nine months. Green and Ewing believe that this case supports the view that hypopyon is due to the passage backward of pus from the ulcer, and they cite two cases, studied clinically, in support of it, in which hydrogen dioxide and fluorescein passed through corneal ulcers into the anterior chamber.

This group of cases by no means establishes the correctness of the view in question, but it has the support of what is known of the course of the physiological lymph streams in the normal cornea. If leucocytes in corneal ulcer always make their way from the deeper tissues toward the point of infection, a course that would seem best calculated to limit infection and save the eye, they must sometimes move against the lymph currents of the cornea, or these must be reversed as an aid in the struggle to repel the bacterial invasion.

Saemisch Section. For suppurating ulcers of the cornea it has long been known that the Saemisch section, the incision dividing the whole width of the ulcer and the entire thickness of the cornea, exerted a most powerful influence for cure. This may be brought about by establishing strong lymph currents from the deeper parts of the eye out through the affected region. D. Webster³ reports a case of recurrent painful ulcerative keratitis promptly cured by this measure. Golovine, however, has reported to the Moscow Ophthalmological Society⁴ a case in which the Saemisch operation was followed by severe hemorrhage, apparently from a tearing of the iris, a portion of which was pushed out in a rounded mass.

¹ Archives of Ophthalmology, November, 1898.

² Trans. American Ophthalmological Society, 1898.

³ American Journal of Ophthalmology, February, 1898.

⁴ Ophthalmic Record, November, 1898.

The General Treatment of Corneal Ulcers. CASSARIPE. Risley¹ reports his experience with a 10 per cent. ointment of cassaripe or cassareep, the inspissated juice of the bitter cassara, *Manihot utilitissima*, which is used in the West Indies to preserve meat. Its use for corneal ulcers was proposed by H. B. Chandler, who states that in large sloughing ulcers in old persons it has given more satisfaction than anything else. Risley had it applied within the lids two or three times daily. It caused no irritation, and in a few minutes after the first application the discomfort from the ulcer was much diminished. The improvement was usually rapid as compared with other modes of treatment. In a case of ophthalmia neonatorum the discharge ceased in two days under the use of cassaripe.

Myles Standish found that some cases did well under cassaripe, but that others, having apparently the same conditions, are not improved by it. He thought it had some influence in lessening corneal opacities, and, therefore, would treat an ulcer with cassaripe for a considerable time after it had apparently healed. E. E. Jack had encountered cases in which it produced a great deal of discomfort. Cassaripe is undoubtedly, as Risley points out, a powerful vegetable antiseptic, and worthy of further careful trial. So far all the trials have been made with a 10 per cent. ointment, using petrolatum as the base. A more extended study of its pharmacology may give us more reliable and effective preparations.

FORMOL. H. D. Bruns has been treating corneal ulcers with formol solutions of the strength of 1 to 1000, and reports² good results. The solution was used every hour and followed by hot bathing of the eye. It should be remembered that such an application is decidedly painful; some patients complain bitterly of a 1 to 2000 solution of "formalin," which is only a 40 per cent. solution of formaldehyde.

MISCELLANEOUS. For the milder cases of corneal ulcer Knapp,³ under holocain anæsthesia, sterilizes with tincture of iodine or silver nitrate. For circumscribed infiltration with hypopyon he immediately uses the galvano-cautery, and for advanced cases the Saemisch section. C. S. Bull thoroughly cures and then applies the galvano-cautery. T. R. Pooley thinks tincture of iodine about as worthless a remedy as could be used in these cases. W. B. Marple finds it uncertain, but in some cases of great benefit.

Phlyctenular keratitis has been the subject of an extended bacteriological study by A. Michel,⁴ who concludes that the corneal phlyctenule is a lesion of reaction against microbes that invade the cornea. In 18

¹ Trans. American Ophthalmological Society, 1898.

² American Journal of Ophthalmology, October, 1898.

³ Archives of Ophthalmology, July, 1898.

⁴ Annales d'Oculistique, October, 1898.

cultures made from phlyctenules upon solid media, principally serum and gelose at a temperature of 35° C., *staphylococcus pyogenes aureus* was found in 10, and 9 were pure cultures. In 7 the white *staphylococcus* was found. Inoculations underneath the corneal epithelium of the rabbit with *staphylococci*, and with some of the other organisms found, produced lesions similar in appearance to the phlyctenule in the human eye.

Bullous Keratitis. This is generally recognized as a condition liable to arise in eyes that have undergone degenerative changes, especially those that have suffered from glaucoma. In another group of cases it follows a somewhat extensive abrasion of the cornea in an otherwise healthy eye. Jensen¹ calls renewed attention to this group of cases. The first outbreak comes usually several months after the original injury. It begins with very severe pain on awaking in the morning, which lasts a few minutes, and then usually ceases with a free flow of tears. If the cornea is examined a large bulla, or the remains of one, the loosened epithelium and denuded cornea, will be found. After three or more days the epithelium is re-formed; but the process may be repeated many times.

TREATMENT. This includes the instillation of atropine and the use of a bandage. The use of cocaine is to be carefully avoided. The condition is probably due to imperfect healing of the original injury, and, on account of liability to it, it is advised that eyes so injured should be carefully bandaged until healing is complete.

Trophic Keratitis. In the matter of keratitis due to lesions of the fifth nerve, it was natural that those cases presenting the most striking disease of the nerve should be first recognized as of this character. Hence the adoption of the term "neuro-paralytic keratitis," and the acceptance of the crude theory that in this condition keratitis was due simply to injury to the cornea from traumatisms, unrecognized by reason of the fifth-nerve paralysis, and that foreign bodies were permitted to remain in contact with the cornea because their presence was unrecognized. The ophthalmologist, however, gradually came to recognize cases as belonging to this class that did not present the evidences of a general paralysis, or sometimes of any paralysis, of the fifth nerve. Harlan, who reported a case occurring in caisson disease and made a careful study of the general subject,² concluded that the condition has its origin in an alteration of the Gasserian ganglion or of the nuclei of the fifth pair, leaving it undecided whether this alteration is of a paralytic or an irritative character, and whether it acts through sensory, vasomotor, or special trophic nerves.

K. K. Wheelock³ reports three cases presenting loss of sensation in

¹ Archives d'Ophtalmol., April, 1898.

² Trans. American Ophthalmological Society, 1897.

³ Ophthalmic Record, February, 1898.

the area of corneal involvement, subnormal sensibility of the unaffected portion of the cornea and abolition of corneal reflex, diminished and variable ocular tension, contracted pupil, slight pain or none, slight irritation or circumcorneal injection. These cases recovered with slight scars after ten to fourteen weeks of active treatment, including cleansing with boric-acid solutions, hot fomentations, and the use of faradic electricity locally, and strychnine, arsenic, and quinine internally. Wheelock argues that this condition should be called *tropho-neurotic keratitis*, because the name points to trophic fibres from the Gasserian ganglion as the seat of lesion, and that it should be distinguished from *neuro-paralytic keratitis*, which properly applies to lesions producing loss of sensation throughout the whole distribution of the fifth nerve, and from keratitis due to exposure of the cornea.

Percy Fleming¹ reports a series of cases of what he terms *neuropathic keratitis*. He points out that exposure does not necessarily cause keratitis, citing old cases of Bell's palsy and exophthalmic goitre to illustrate this point. On the other hand, in cases of ptosis with disease of the trigeminus, although the cornea is always covered it may not escape. By keeping the cornea covered and moist for a short time after operation, Keen² finds the Gasserian ganglion can be completely removed and the cornea rendered entirely anæsthetic without causing this affection, and cases occur, of which Fleming reports one, in which the typical neuropathic keratitis is seen, although the cornea is normally sensitive. Cases of this last class, with the association of the keratitis with neuralgia, and the fact that cases are frequently met with in which iritis accompanies or precedes the keratitis, incline Fleming to the view that the lesion is one of irritation. It may act either through influence on the secreting structures of the uveal tract, or by more directly controlling the nutrition of the cornea.

Corneal Opacities. A. Gradle³ calls attention to a form of corneal turbidity easily overlooked, and reports a series of cases in which it was associated with asthenopic symptoms, irritability of the eye, burning, smarting, and the sensation of a foreign body in the eye. It was sufficient to impair vision slightly, although it could not be detected by the ophthalmoscope. It is recognized only by good lateral focal illumination and a strong magnifying lens. It consists in an exaggeration of the turbidity of the normal cornea, which can be resolved into a granular appearance under such conditions of illumination. It is, therefore, difficult to say when this turbidity is abnormal unless it is pretty

¹ The Lancet, July 2, 1898.

² American Journal of the Medical Sciences, November, 1898.

³ Ophthalmic Record, September, 1898, and Journal American Medical Association, September 24, 1898.

decided or is limited to one eye. Gradle also finds that corneal turbidity may help to cause imperfect vision after cataract extraction.

Interstitial keratitis due to syphilis, although more frequent in children suffering from hereditary syphilis, is by no means confined to this period of life. Juler¹ reports a case in a woman of thirty-three years, who had acquired syphilis ten years before, and had suffered from iridocyclitis.

Groenouw, at the Heidelberg Ophthalmological Congress for 1898, demonstrated small nodular, gray opacities situated immediately beneath the epithelium, chiefly near the centre of the cornea, which had persisted almost unchanged in one case for eleven years. Familiarity with these slight persistent opacities, which remain unnoticed until the cornea is very closely examined, is necessary to avoid ascribing undue importance to them in connection with recent disease.

A dull, steamy, or hazy appearance of the surface of the cornea is not uncommon in eyes that have undergone grave inflammatory and degenerative changes. It is due to small vesicles, or *vacuoles in the anterior epithelium of the cornea*. That these vacuoles or spaces may be due to different processes is indicated by the results of studies of the subject by P. Fridenberg² and E. Stieren.³ Fridenberg, in a case of staphyloma of the cornea, found that vacuolation occurred in the superficial layers of the cornea, while the deep layers escaped. It resembled that seen in eczematous inflammation of the skin, and was generally due to degenerative changes; there was no evidence of œdema of the epithelium. Stieren studied an eye in which uveitis had followed gonorrhœal ophthalmia. The vacuolation affected chiefly the deeper layers of the epithelium, and there was evidence of the displacement of the cells by œdema. Absorption of corneal fluids had been checked in the region of Schlemm's canal, which was much narrowed by inflammatory deposits, which probably closed the lymph spaces communicating with it. Both views as to the production of these vacuoles find support in the previous work of other competent observers, although the larger number of authorities support the theory of causation by œdema.

It is well known that inflammatory opacities of the cornea, in the absence of anterior synechia, continue to grow less dense for a long time. While this gradual clearing, which occurs without treatment, casts a doubt as to the influence that may be ascribed to persistent treatment, it seems entirely reasonable to suppose that while this natural tendency to the clearing of the cornea exists, appropriate treatment can reinforce it and make it more effective, as adverse influences could certainly oppose

¹ British Medical Journal, August 20, 1898.

² New York Eye and Ear Infirmary Reports, January, 1898.

³ Johns Hopkins Hospital Bulletin, December, 1898.

or nullify it. J. W. Bullard¹ reports a case of opacity following ophthalmia neonatorum without perforation of the cornea, which was at first so dense that only a very faint indication of the iris could be seen at the lower inner border of one cornea. Massage with ointment of yellow oxide of mercury, 1 to 60, was kept up for two years, when it was possible to recognize a dense anterior polar cataract which occupied each contracted pupil. The treatment was continued two years longer, when iridectomies gave vision of 8/200 and 12/200.

For adherent leucoma that promises to develop into anterior staphyloma, Fuchs² removes the affected part with the corneal trephine, and substitutes for it a piece cut with the trephine from the cornea of a human eye about to be enucleated. This graft becomes opaque, but the iris is freed from the cornea, and the eye is given a chance to escape becoming staphylomatous.

In tattooing a leucomatous cornea, Fuchs³ has tried the operation of removing the corneal epithelium by cutting through it with a large trephine and dissecting the included piece off with as little of the corneal tissue as possible. After bleeding was checked the India ink was applied and well rubbed and scraped into the denuded portion with the point of a Graefe knife. The circle of epithelium was then replaced. It soon shrivelled up and dropped off, but the result was excellent, the sharply defined margin giving quite the effect of a pupil.

Keratoglobus is often described as merely a part of the general enlargement of the eyeball, buphthalmos. Harlan⁴ reports two cases, a brother and sister, in which there was no evidence of enlargement of any part of the globes except the anterior segment. The horizontal diameter of the cornea was 14 mm. in three of the eyes, and 15 mm. in the other, the vertical diameters being $13\frac{1}{2}$ mm.; the horizontal diameter of the eyeball was, in each case, 24 mm. The anterior chamber was very deep, and the iris tremulous. In one eye the lens was absent and the iris showed a number of small radiating slits. The eyes were all highly hyperopic, 5 to 7 D. The corneas were all transparent. H. Knapp⁵ reports a case of white, semi-transparent kerato-globus in both eyes, with increased intra-ocular tension, coming on in a woman of forty-five years, after anterior sclero-uveitis. Iridectomy on one of the eyes was followed by slow return of the tension to normal, improvement of sight, and diminution in the size of the eye. Knapp's case seems to be a connecting link between glaucoma and buphthalmos, the so-called congenital or juvenile glaucoma.

¹ Ophthalmic Record, April, 1898.

² As reported by R. E. Bickerton, British Medical Journal, September 17, 1898.

³ Loc. cit.

⁴ Archives of Ophthalmology, March, 1898, and Ophthalmic Rev., April, 1898.

⁵ Archives of Ophthalmology, July, 1898.

Keratocornus of high degree, especially if progressive, calls for surgical treatment. R. Sattler¹ resorts to operation when vision is reduced below one-tenth. He has obtained the best results by partial abscission of the apex and by linear intersecting incisions in this region, with subsequent tattooing of the scar. Knapp has obtained satisfactory results by use of the galvano-cautery, which should be made to perforate the cornea.

Suture of the Cornea. W. H. Bates² reports the results of a series of experiments upon the eyes of rabbits. He finds that loss of vitreous and intra-ocular hemorrhage can be prevented, and the corneal wound readily and firmly closed; and, therefore, that the use of sutures should be a valuable improvement in the technique of cataract extraction. There should, however, be a change from the methods previously practised in introducing the sutures. H. W. Williams, who first employed a suture to close the corneal wound, only included the superficial layers of the cornea, and Kalt and Mendoza by slightly different methods did the same. Prolapse of the iris sometimes occurred. Bates found that such a suture approximated the wound upon the outer surface, but caused it to gap upon the inner surface, so that the iris was always incarcerated. He recommends, therefore, the passing of the suture entirely through the cornea and, as nearly as possible, perpendicular to the corneal surface.

Bates has shown the essential inefficiency of the superficially placed suture, but the dangers which may be escaped by the use of sutures for cataract extraction seem small compared with the increased risk from greater injury to the cornea, to say nothing of the increased difficulty and prolongation of the operation. It is probable, however, that in angular and lacerated wounds of the cornea, and possibly in the treatment of keratocornus, the corneal suture, including the whole thickness of the membrane, may find a field of usefulness.

THE IRIS AND PUPIL.

Iritis is one of the diseases of the eye closely connected with general disease, and this connection is of the highest practical importance in the direction of therapeutics. It is generally stated that one-half of all cases of iritis are due to syphilis. Brailey and Stephenson³ think that if hereditary syphilis be taken into account, the proportion is nearer 60 per cent.; they ascribe 30 per cent. to rheumatism, but apparently loosely use the term so as to include cases due to "cold," etc. The other 10 per cent. are caused chiefly by traumatism, gonorrhœa, gout, diabetes,

¹ Trans. American Ophthalmological Society, 1898.

² Archives of Ophthalmology, March, 1898.

³ System of Diseases of the Eye, edited by Norris and Oliver, vol. iii.

and various fevers. A case of kerato-iritis in typhoid fever is recorded by Veasey.¹ Fage² reports a case of iritis in a young girl as due to *ozæna*, and Posey³ a case of uveitis which he regards as resulting from an intense chronic inflammation of the nose and accessory sinuses. The coincident influence of two or more causes is often traceable.

TREATMENT. In the local treatment of iritis mydriatics hold a leading position, but there are limitations to their usefulness. Berry⁴ points out that if the most effective application of a mydriatic for three or four days fails to cause a fair dilatation of the pupil, it may be better to stop using it, especially in the aged. In cases in which cyclitis is an important feature it is to be used quite tentatively.

In some cases of recurrent iritis, and sometimes for the sequels of iritis, iridectomy is required. In such cases the rule has been considered imperative not to operate until the inflammatory symptoms had all subsided and the eye had been for some months entirely quiet. But E. E. Jack⁵ points out that the observance of this rule often entails long waiting, while the eye remains painful and undergoes additional degenerative changes, and that ultimately when the operation is done the results are unsatisfactory. He reports two cases in which he did *iridectomy during the stage of active inflammation*. One was a boy who had severe iritis, exclusion of the pupil, iris bombé, and intense pain. Iridectomy was done under ether. The pain ceased very soon after the operation, the opening made partially filled up, and the iritis quickly subsided. The other patient was a woman of forty years, who for many years had suffered from attacks of iritis with severe pain. She was almost worn out with pain, and Jack was called to do an enucleation. The pupil was blocked with exudate. Instead of enucleation an iridectomy was done without ether. The relief was immediate, and there was no return of the trouble before the patient's death, one and one-half years later.

Iris Movements and Pupillary Changes. Spiro has studied *the effects of mydriatics and myotics* on the pupil in cases of oculo-motor paralysis.⁶ He found that atropine widened the pupil from 1 to 1.5 mm., and eserine caused a maximum contraction of the pupil. Spiro thinks the dilatation by atropine is due not to irritation of the sympathetic, but to more complete paralysis of the nerve-endings in the iris. The action of eserine may be upon nerve-endings or upon the sphincter.

Paralysis of the lower half of the iris following iritis is reported by de Schweinitz.⁷ He ascribes it to injury of the nerve-endings by the

¹ Ophthalmic Record, April, 1898.

² Rec. d'Ophtalmol., June, 1898.

³ Ophthalmic Record, January, 1898.

⁴ Edinburgh Medical Journal, May, 1898.

⁵ Boston Medical and Surgical Journal, May 26, 1898.

⁶ Ophthalmol. Klinik, March 5, 1898.

⁷ Ophthalmic Record, November, 1898.

inflammatory process, and points out that a similar partial paralysis of the iris is not rare after traumatism.

Unilateral Reflex Iridoplegia has been studied by Lesynsky,¹ who finds it is always indicative of central nerve degeneration, and is generally syphilitic in origin. St. Bernheimer,² from a study of the ciliary ganglion by experimentally producing degenerative changes in it by evisceration of the eye, concludes that it contains cells that belong to the pupil contracting tract, and, therefore, that changes in it can cause the fixed pupil of reflex iridoplegia, an explanation which readily lends itself to these unilateral cases.

Schirmer,³ from a study of optic-nerve fibres concerned in the pupillary reflex, concludes that they are distinct from the visual fibres, and that they do not end in the rods and cones, but probably in the inner layer of the retina. In the optic nerve they seem to pass with the visual fibres belonging to the same region of the retina, but they are better protected from compression than the visual fibres, although more liable to suffer from inflammatory processes. Hence the size of the pupil may help to differentiate between retro-bulbar compression and retro-bulbar inflammation.

Recurring Internal Ophthalmoplegia is the title under which H. F. Hansell⁴ reports an interesting group of four cases. Both the pupil and accommodation are affected, though often unequally. The condition, he thinks, must be regarded as a symptom of nuclear disease. It is found in persons apparently healthy and free from inherited or acquired constitutional taint. It may exist for many years without complications, and the causes of recurrences have not been discovered.

Lymph Channels of the Iris. Nuel,⁵ from an experimental study by means of injections of India ink into the vitreous, reports that the iris contains an important system of lymph vessels to which the aqueous gains access through openings upon its anterior surface. In the rabbit, which has commonly been used for such studies, this system is very rudimentary and, therefore, has not attracted attention. In the cat and dog it is much more highly developed. It cannot be injected post-mortem, because the pressure required causes the channels to collapse, and the dilatation of the pupil at death is attended with their collapse. In human eyes there are great variations in the development of these channels, which start in the interstitial clefts of the iris. In some they are hardly perceptible; in others they are as greatly developed as in the eyes of the cat. Nuel suggests that these variations may be of impor-

¹ New York Medical Journal, August 6, 1898.

² Gräfe's Archiv für Ophthalmol., xliv. 3.

³ Ophthalmic Record, April, 1898.

⁴ Ophthalmic Review, August, 1898.

⁵ Loc. cit., xlv. 2.

tance in respect to the predisposition to glaucoma, and that myotics opening the channels and mydriatics closing them, may account for the influence of these drugs in glaucoma. Benoit, who assisted Nuel in this investigation, has suggested that the distribution of these channels may account for the predilection of gumma and tuberculosis of the iris for the pupillary zone and the extreme periphery.

THE CILIARY BODY AND CHOROID.

Choroiditis and Chorio-retinitis in young persons is the subject of a paper by A. C. Corr.¹ He reports cases in which syphilis could be excluded, and which he believes to have been due to excessive functional activity under unhygienic conditions. This form of choroiditis, which, unfortunately, is not rare, is of the greatest practical importance, by reason of the large number of children that are subjected to these etiological conditions.

Tumors of the Ciliary Body. GUMMATA. Juler² reports a case, symmetrical in the two eyes, occurring within four months after the initial lesion. The symptoms of syphilis were marked, and included double iritis, which came on at three months, and gumma of the fibula occurring shortly after the ciliary body was affected. There was thinning and bulging of the sclera in the ciliary region, which disappeared under mercury and potassium iodide, and later the iris was dragged by cicatricial contraction so far back that its pupillary margin was out of sight. There was left a high degree of corneal astigmatism (2.5 D. and 5 D.) with the flattening in the direction of the meridian passing through the staphyloma. Argyll Robertson³ has seen high astigmatism left by ciliary staphyloma almost disappear after a time.

ADENOMA OF THE CILIARY BODY. Under this title Alt⁴ reports five cases of a form of microscopic tumor, which he believes has not been before described. The tumors were certainly not malignant, and apparently had caused no symptoms or inconvenience, only being discovered after death, or after the enucleation of the eye for some other condition. Histologically they undoubtedly started from the cells of the ciliary portion of the retina. The tumor consisted of cells and a coagulated amorphous substance. The cells were arranged in parallel rows around a very small central lumen, like glandular tubules. The whole picture suggests that of a gland when, after closure of its efferent duct, secretion goes on to distention of its ducts and consequent flattening and atrophy

¹ American Journal of Ophthalmology, July, 1898.

² Ophthalmic Review, August, 1898.

³ British Medical Journal, August 20, 1898.

⁴ American Journal of Ophthalmology, November and December, 1898.

of the secreting cells. The smaller tumors contained larger proportions of the cells and cell cylinders. In the larger tumors the amorphous material predominated, and the largest, had the process gone a little further, would have appeared like a cyst. In connection with these tumors, Alt examined the pigmented globular excrescences at the pupillary margin of the iris of the horse. While it is questionable whether these are really glandular, he thinks they are the only structure found in the eye of a lower animal at all akin to the tumors in question.

SARCOMA. O. Walter¹ reports a case of sarcoma of the ciliary body. The growth had infiltrated the adjoining iris, had pushed it away from its ciliary attachment, and presented in the angle of the anterior chamber.

Tumors of the Choroid. **LEUCOSARCOMA OF THE CHOROID.** This is a rare growth. In a case reported by de Schweinitz,² the symptoms when the patient was first seen were simply those of a large detachment of the lower half of the retina, with distinct undulation of the detached portion. The eye was myopic, and the clinical history that of simple detachment which had existed for some time. About eighteen months later intense pain and increase of tension developed, and enucleation revealed the choroidal tumor. The diagnosis of sarcoma of the choroid complicated by the presence of subretinal fluid, always very difficult, was in this case made impossible by the patient's failure to return until the glaucomatous symptoms occurred. In a considerable proportion of cases the use of direct sunlight for the ophthalmoscopic illumination of the fundus will reveal the new growth. Probably it is not too much to say that all cases of detachment of the retina of doubtful origin should be carefully examined by this means.

A case probably of commencing leucosarcoma of the choroid was discovered by Allport,³ with the ophthalmoscope, in a patient seeking relief from eye-strain. It was situated to the temporal side of the optic disk. A retinal vessel passed over it and some pigment on its surface seemed to indicate that it sprang from the choroid. A small scotoma, especially for red and green, adjoined the physiological blind spot.

SARCOMA OF THE CHOROID WITH PHTHISIS BULBI. The connection between these conditions is an interesting and obscure subject. Leber⁴ examined fifty-one cases in which these conditions were associated, but was uncertain whether the phthisis predisposed to the new growth, or whether it was produced by the cause of the tumor. L. P. Hamberger⁵ reports a case in which an atrophied eyeball, which had been blind for five years, was enucleated and a small melanosarcoma arising from the

¹ Archives of Ophthalmology, September, 1898.

² Trans. American Ophthalmological Society, 1898.

³ Ophthalmic Record, February, 1898.

⁴ Bericht u. d. xxvi. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

⁵ Johns Hopkins Hospital Bulletin, March, 1898.

posterior portion of the choroid was found. Symptoms of metastatic involvement of the liver had already arisen. C. D. Marshall¹ reports the case of a woman of fifty years, who had lost her sight thirty-six years before from injury with a skipping-rope. The eye was shrunk but remained quiet until within eighteen months, when it became inflamed, irritable, and very painful and hard, but with no other indication of its real condition. On enucleation the anterior portion of the eye was found occupied by a mass of bone, but at the upper back part of the eye there was a large bulging melanotic mass, a process from which surrounded the optic nerve. Marshall refers to it as a typical example of the folly of allowing a blind and painful eye to long remain without seeking relief. In another case the eye had been defective and divergent for twenty years, with attacks of pain and inflammation for the last three or four years. On attempting enucleation the eye was found to be fixed by a dense coal-black mass of sarcoma projecting posteriorly. Sarcoma emerges from the globe along some of the vessels which pierce the sclera, and if not along the vortex veins or the anterior ciliary vessels, it is apt to do so along the posterior ciliary vessels.

Marshall points out that increased tension is always accompanied by closure of the angle of the anterior chamber; yet it is much more likely to occur when the growth does not approach or invade the ciliary body. He suggests that the presence of the tumor may aid filtration in this region, and may also tend to prevent complete closure of the filtration angle. A dilatation of the lymph channels, described by Nuel (p. 390), would have such an influence.

METASTATIC CARCINOMA OF THE CHOROID has recently been the subject of three important papers. C. D. Marshall² reports two cases of his own and summarizes the cases previously reported. F. Lagrange³ reports one case and reviews the previous literature of the subject. G. E. de Schweinitz⁴ reports two cases, with microscopical examination in one of them. These make a total of twenty-seven cases. The seat of the primary growth has usually been the breast. The other localities have been the stomach (three cases), the lungs (two), and the thyroid (one). Both eyes have been invaded by such growths in eight cases, and in the other cases the left eye about twice as frequently as the right. The growth has usually been confined to the choroid, in a few cases has spread back along the optic nerve, and once invaded the retina. The growth begins in the region of the macula and extends laterally in all directions, remaining comparatively flat. Its progress is rapid, vision

¹ Ophthalmic Record, December, 1898.

² Royal London Ophthalmic Hospital Reports, vol. xiv., Part III.

³ Annales d'Oculistique, January, 1898.

⁴ Transactions American Ophthalmological Society, 1898.

being destroyed in a few weeks. The greatest length of life after the discovery of the choroidal growth has been two years, and all but four of the patients have died within one year. Twenty-one of the patients were women.

PSEUDO-TUMOR OF THE CHOROID. Haab¹ records a curious case in which a tumor in the region of the lachrymal sac so pressed upon the eye as to cause its coats to bulge inward in such a way as to give the appearance of an intra-ocular tumor, for which the eye was enucleated along with the lachrymal tumor which caused this appearance.

SYMPATHETIC OPHTHALMITIS.

The affection of the second eye after loss of one from injury is such a striking phenomenon that it has been widely used to explain (?) other conditions supposed to resemble it. It has not failed, either, to attract the attention of the most skilful and painstaking workers in ophthalmology. It must be admitted, however, that we are as yet entirely ignorant of the means by which the morbid influence passes from the injured to the sympathizing eye, and of the essential conditions which favor or oppose its transmission. The clinical characteristics of the disease are so suggestive of the direct extension of an infective process from the one eye to the other, that when Deutschmann announced, some years ago, that he had discovered the bacterial basis for such a theory, there was a general disposition to accept the statement. Since then many observers have gone over the ground, none have confirmed Deutschmann's observations, and he has since shifted ground and admitted errors in his former work. C. E. Shaw has recently studied the subject again, microscopically examining eight eyes, four of which had caused sympathetic ophthalmia, and he finds² that there are no facts to form a sufficient foundation for the migratory theory. The absence of meningitis, which would be expected if microbes made their way from one eye to the other by way of the optic chiasm, and the failure of panophthalmitis to cause sympathetic disease, are fatal to this theory, he thinks.

The absence of bacteria from eyes removed because they have caused, or seem likely to cause, sympathetic ophthalmitis, is striking. Of nearly one hundred such eyes examined carefully for bacteria, the results have been negative in all but two or three, and in these there was nothing peculiar in the organisms recognized. S. C. Ayres³ reports a case in which the eye was enucleated ten weeks after injury, the other eye having been affected about three weeks and its vision reduced to counting

¹ Bericht u. d. xxvi. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

² British Medical Journal, June 18, 1898.

³ American Journal of Ophthalmology, February, 1898.

fingers. The eye was examined microscopically by Alt, who reports: "I was in great hopes of being able to find micro-organisms in the tissues of the eye. This seemed the more likely, since the character of the round-cell infiltration in the different tissues, as described, showing multitudinous tubercle-like aggregations, resembled so much a microbic inflammation. To this end I stained numerous sections according to various methods for the study of bacteria in tissues; yet again, as in former occasions, I was absolutely unsuccessful. Neither at the seat of injury in the ciliary body, nor in the pia mater sheath of the optic nerve, in which the inflammation evidently spread backward toward the brain even more fiercely than in the optic nerve itself, could I find any bacteria. My disappointment was as great as my search for the micro-organisms was ardent."

In spite of such disappointments the search for micro-organisms is likely still to go on. Meanwhile there is a disposition to recur to the old theory of a reflex process transmitted through the ciliary nerves. Although these have often been reported normal in microscopic appearances, this does not negative a theory which rests on their functional activity, even though it be a perverted activity. In this connection cases of sympathetic ophthalmia connected, apparently, with nerve irritations other than that caused in the injured eye, are of special interest. Sutphen¹ reports a case in which the left eye was removed two weeks after injury, and two weeks after that the right eye was found red and irritable. Under atropine, with calomel internally, the eye became quiet, but eight days later became again inflamed, and two days later showed synechia and optic neuritis. On examining the left socket strong bands of adhesion were found between the upper lid and the nerve-stump, causing traction upon the latter with every act of winking. These bands were divided, and rapid permanent improvement followed. The above case may simply have been one of those in which an attack of sympathetic inflammation, usually comparatively mild, comes on within two or three weeks after the removal of the exciting eye. Such an explanation, however, would not apply in two cases reported by G. Ferdinands.² In one of these the injured eye had been removed fourteen years previously. The patient, after an operation to prepare the socket, now began wearing an artificial eye, but only occasionally. Three years later she had iritis and keratitis punctata, which relapsed several times, but was controlled by atropine. In the other case the injured eye had been enucleated twenty-one years (four days after the injury), when the patient found that wearing his artificial eye gave him pain in the brow, and noticed also impaired vision and signs of inflammation in his remain-

¹ Transactions American Ophthalmological Society, 1898.

² British Medical Journal, June 18, 1898.

OPHTHALMOLOGY.

When seen several months after this, there was well-marked...
 ...when suddenly there were relapses, and vision was reduced
 ...injury does not guarantee the
 ...simple post
 ...the above, or even
 ...The patient only

INFLAMMATION OF THE EYE AND HEAD OF THE OPTIC NERVE

... have been the
... In 1882 the late E. G.
... of PHARMACY.
... August, 1888
... February 5, 1898

Loring proposed *premature delivery for the prevention of blindness* from albuminuric retinitis coming on during pregnancy. The suggestion was generally received with favor, and has been acted on a good many times since. It is not, however, simply a case of sacrifice of the foetus to save the sight of the mother, for generally the life of the mother is also very gravely jeopardized by the continuance of pregnancy, while the chances for the birth of the child alive and its subsequent survival are greatly less than for the average of normal pregnancies. A. E. Adams¹ reports two cases in which premature delivery was effected for this indication. In one it was done during the eighth month, the child living, and the mother, whose sight had been reduced to distinguishing between light and darkness, recovering vision of 20/30 within a year afterward. In the other case a dead foetus was delivered at six and one-half months. Eclampsia occurred but the patient recovered, and vision, which had been reduced to perception of large objects, was regained to 20/20 in one eye and 12/200 in the other. The optic disks remained pale, with some pigment changes, but the retinal hemorrhages and exudate were absorbed.

PROGNOSIS. The prognosis for recovery of sight and continuance of life is better for albuminuric retinitis arising during pregnancy than in other cases. Nevertheless, marked improvement may occur in other cases of albuminuric retinitis. Bruns² reports the case of a man suffering from typical albuminuric retinitis, whose vision rose in forty-six days from 10/200 to 20/30 under the use of potassium iodide, 5 grains, and tincture of digitalis, 7 minims, three times a day, with freedom from work and a good general regimen.

Optic Neuritis in connection with brain tumor has been studied by W. C. Krauss.³ He finds it occurs in about 90 per cent. of all cases, although often only very late in the disease. He thinks it more frequent in cerebral than in cerebellar disease. The location, size, and nature of the tumor exert but little influence in the production of papillitis, except that it is less likely to accompany those of slow growth. Deyl, at the Moscow International Medical Congress, offered a new explanation of the choked disk. He finds that obstruction to the venous circulation occurs, not at the disk, but where the central retinal vein passes out through the dural sheath of the optic nerve. This sheath is separated from the nerve by the dropsical accumulation within it, and by its displacement causes the vein to be sharply bent and compressed where it passes through it.

Neuro-retinitis of Anæmia. This may also simulate the choked disk

¹ Transactions American Ophthalmological Society, 1898.

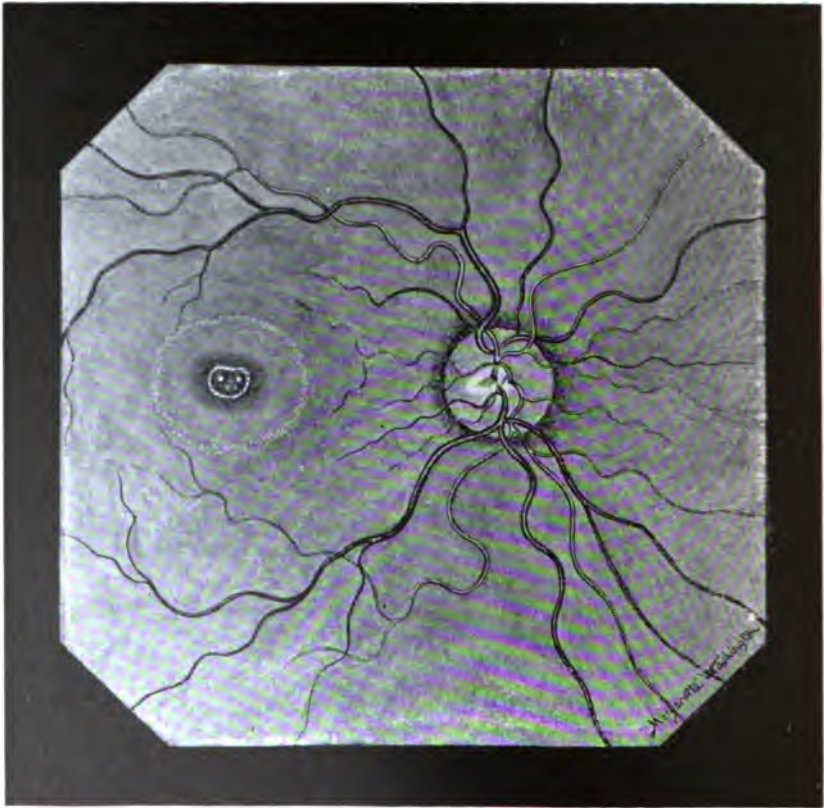
² American Journal of Ophthalmology, October, 1898.

³ Philadelphia Medical Journal, October 1, 1898.

of brain tumor. Patrick¹ reports a case of the kind in which relief of the anæmia brought restoration of normal vision. Bannister² reports a case of severe retino-papillitis and impaired vision in chlorosis, which also ended in recovery. He calls attention to the rarity of reports of ocular disturbance in this disease.

Retinitis Circinata, first described by Fuchs in 1893, is characterized by grayish or yellowish opacity at the macula, surrounded at some little distance by a zone or wreath of white spots or patches, which may coalesce to form a lobulated figure. Vision is greatly diminished, but total

FIG. 49.



Degenerative changes in the retina.

blindness does not result. Retinal hemorrhages also occur. Several cases have now been reported by other observers, and Ammann³ reports one in which the sudden death of the patient enabled him to examine

¹ Journal of Nervous and Mental Diseases, December, 1898.

² Loc. cit.

³ Archives of Ophthalmology, March, 1898.

the eye histologically. He found that the white spots are fat-cell clusters, which appear where hemorrhages have been, but only at a time when nothing of the hemorrhage is to be seen at that point. There are also hyaline masses, resulting from disintegration of red blood-corpuscles, which are not visible ophthalmoscopically, or at most only cause a dirty red discoloration of the affected retina. A case possibly allied to this form of disease, but in which the changes were slighter, no hemorrhage being visible at any time and vision remaining but slightly impaired for over a year, is reported by de Schweinitz,¹ who suggests its origin in degeneration of the retinal ganglion cells, relating it to the condition next to be considered. (See Fig. 49.)

Amaurotic Family Idiocy is the title which seems to be gaining in favor for the condition first described by Warren Tay, characterized by progressive loss of sight and a white area in the region of the macula having a dark-red spot at the centre, and margins that fade into normal fundus. Later the optic nerve becomes atrophied. The changes are about the same in the two eyes. The disease comes on in early childhood or infancy, the child losing muscular activity and power, and undergoing mental degeneration until death occurs in the first or second years. (Koller has reported one case living in a condition of idiocy at the age of four years.) Sachs² collected twenty-seven cases, of which seventeen occurred in six families, showing its strong tendency to affect the successive children of the same parents. All reported cases thus far have been of the Jewish race. Syphilis, alcoholism, and diathetic conditions do not seem connected with its causation, but a neuropathic heredity and consanguinity of parents were made out in some cases.

Cases are reported by A. Jacobi,³ and Peterson and Hirsch.⁴ Peterson found that the most striking microscopic changes were the great deficiency and irregular distribution of the cells in the cerebral cortex. Hirsch found alterations in the ganglion cells of both the anterior and posterior columns of the spinal cord, the basal ganglia and the cortex of the brain. W. A. Holden, who studied the retinas of Hirsch's case, found slight œdema of the nerve fibre and ganglion-cell layers. The thickness of these layers at the macula would account for the appearances seen there during life. In the optic nerve the medullary substance of some fibres in each bundle was broken down. Hirsch thinks the clinical and anatomical facts are against the theory of an arrest of development, and that the disease may be of toxic origin, the poison coming possibly from the mother's milk. Sachs opposes this view. He suggests (in discussing

¹ Ophthalmic Record, November, 1898.

² Deutsche med. Wochenschrift, January 20, 1898.

³ Archives of Ophthalmology, March, 1898.

⁴ Journal of Nervous and Mental Diseases, July, 1898.

Jacobi's case) that each child is born with a certain potentiality of development, and in these cases the power of development ceased at the age of a few months and degeneration set in. He points out its relationship to other family neuroses, notably spastic palsies and hereditary idiocy, and, possibly, to *hereditary optic atrophy*, which occurs in youth or early adult life. In regard to "hereditary optic atrophy," of which Posey¹ describes three cases in successive generations of one family, it may be noted that the atrophy follows a visible departure of the retina from normal.

Retinitis Pigmentosa and Allied Conditions are discussed by Fuchs.² He regards this so-called "retinitis" as an insidious atrophy of the retina, the cause of which is to be sought in the choroid which nourishes it. The pigmentation, although the most frequent and striking ophthalmoscopic sign, is of secondary importance. Characteristics are the hereditary and family occurrence, commencement in early life with night-blindness, slow but uninterrupted progress, and retinal atrophy recognized by narrowing of the retinal vessels and consecutive atrophy of the optic nerve. He refers to the cases of this class which show no retinal pigment, and especially to *retinitis punctata albenscens*, of which he reports his fourth case. He points out that under this name entirely different conditions have been reported, and he would confine it in future to cases showing the following clinical features: the existence of the disease in childhood, and, as a rule, in several members of the same family, blood relationship of the parents, diminution of direct vision, marked concentric narrowing of the field of vision, and night-blindness.

Schoen³ found rhachitis to have existed in four out of seven cases of retinitis pigmentosa, and ascribes the astigmatism that often accompanies it to the rhachitis. He claims that it is possible to prevent the retinal changes by early correction of the error of refraction.

In retinitis pigmentosa occurring late in acquired syphilis, the involvement of the choroid is usually quite evident. A closely allied condition causes in some cases the striking symptom of *ring scotoma*. Baas⁴ reports that in an eye affected with syphilitic chorio-retinitis, which during life exhibited a well-defined characteristic ring scotoma, he found degeneration of the external layers of the retina, the inner layers remaining intact. Leber states that ring scotoma is attributable to disease of the optic nerve, although no anatomical demonstration of such a connection has been offered. Wagenmann reported a case of ring scotoma

¹ Annals of Ophthalmology, July, 1898.

² Archives of Ophthalmology, September, 1898.

³ Centralbl. für prakt. Augenheilk., January, 1898.

⁴ Bericht. u. d. xxvi. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

in retinitis pigmentosa in which there were pigment alterations in the region of the scotoma, while within and outside of this pigmented region there was no trace of pigment. W. E. Bruner¹ reports a case of ring scotoma with night-blindness, in a woman of thirty-seven years, with irregularity of the superficial pigmentation not connected with the scotoma. Central vision was 6/6 and 6/8 partly. The scotomas were symmetrically placed in the two eyes; they were incomplete upward and outward, but became complete in this direction with diminished illumination. The condition remained unchanged after nearly two years, and Bruner is inclined to regard it as congenital.

Retinal Vascular Disease and Hemorrhage. BLINDNESS FROM LIGATION OF THE INTERNAL CAROTID ARTERY. Sigrist² reports two cases of this very rare accident. In one the ligation was done for hemorrhage secondary to removal of cancer at the base of the tongue. The patient died six days later, and a red thrombus was found extending up the carotid and 6 mm. into the ophthalmic artery. In the other case the external and internal carotids were tied for traumatic pulsating exophthalmos. The ophthalmoscopic picture was that of retinal embolism.

THROMBOSIS OF THE CENTRAL RETINAL ARTERY. Four cases simulating embolism were reported to this same meeting of the Heidelberg³ Congress, and anatomical specimens were presented by von Michel. Two were due to arterio-sclerotic changes, located where the vessels entered the optic nerve; another occurred in connection with choked disk from cerebellar tumor, and the fourth arose in metastatic ophthalmia in a case of general sepsis.

Alt examined microscopically an eye enucleated for hemorrhagic glaucoma, following what was regarded, from the clinical history and symptoms, as thrombosis of the central retinal vein. He found⁴ the real pathological changes of the bloodvessels began where the central vessels divided in the walls of the glaucoma cup. Most of the arteries were closed altogether in consequence of periarteritis. The veins were empty or contained hyaline thrombi. Hemorrhages pervaded the whole retina. Vascular disease was also found in the choroid and posterior ciliary arteries.

RETINAL HEMORRHAGE. Among 90 cases, Amman⁵ found that 57 were due to senile changes, and of these 33 were caused by thrombosis of the retinal veins. Spontaneous recurrent hemorrhage in young persons was credited with 10 cases; anæmia, 8; syphilis, 7; alcohol and tobacco, 7, and scurvy, 1.

¹ Ophthalmic Record, November, 1898.

² Bericht. u. d. xxvii. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

³ Ibid.

⁴ American Journal of Ophthalmology, October, 1898.

⁵ Beiträge zu Augenheilk., July 23, 1898.

GENERAL ARTERIAL DISEASE gives ophthalmoscopic evidence, according to Gunn,¹ by a lighter color of the arteries than they exhibit when sound, with a bright reflex from the hyaline deposit within their walls. They also become irregular in character, especially the small arteries in the region of the macula, and are sometimes tortuous. From damming back of the blood-current the walls of the veins and capillaries undergo degeneration, giving rise to hemorrhages. Among 17 hemiplegias, he had found the retinal arteries normal in 7 and altered in 10, in 7 of which the changes were quite characteristic. R. T. Williamson² calls attention to the *unilateral retinal changes* that occur in grave cases of *cerebral hemorrhage, embolism, and thrombosis*. In 8 cases of fatal cerebral hemorrhage he found retinal hemorrhage in the eye on the side of the lesion in 4, bilateral albuminuric retinitis in 2, and no retinal hemorrhage in 2. In 4 cases of cerebral embolism he found retinal hemorrhage on the side of the lesion in 1, slight dilatation of the retinal vessels on that side in 2, and no change in 1. In a case of cerebral thrombosis there was marked dilatation of the retinal vessels on the side of the lesion only. These changes are sometimes present only in the last twenty-four or forty-eight hours of life, and probably will rarely be found in mild cases which do not end fatally.

In a case of splenic leukaemia reported by Finlayson,³ sudden impairment of hearing, with vertigo, was recognized as due to *labyrinthine hemorrhage*, by the occurrence of retinal hemorrhage and subconjunctival ecchymosis. The *malarial lesions of the eye*, according to Yarr,⁴ all originate in disturbances of the circulation. He includes optic neuritis, retino-choroiditis, retinal hemorrhages, effusions into the vitreous, and amaurosis, both intermittent and persistent, ending sometimes in optic atrophy. He does not include some such conditions as keratitis and ocular palsies, which, though less frequent perhaps, are clearly traceable to the influence of the malarial parasite. Bruns⁵ reports a case of atrophy and fatty degeneration of the retina following malarial hemorrhage. He points out that the malarial hemorrhages are always seated in the deeper layers of the retina, having rounded and not feathery edges.

INTRA-OCULAR HEMORRHAGES IN ADOLESCENTS are considered systematically by Abadie,⁶ who classifies them thus: Sudden recurrent hemorrhages, the comparison of which to epistaxis he indorses. These are to be met by tonics and hygienic measures. Hemorrhages connected with dyscrasia begin insidiously, and are small, numerous, and attended with

¹ Ophthalmic Review, March, 1898.

² British Medical Journal, June 11, 1898.

³ Ibid., December 31, 1898.

⁴ Ibid., September 24, 1898.

⁵ American Journal of Ophthalmology, October, 1898.

⁶ Archives d'Ophthalmol., July, 1898.

opacities of the vitreous. For these he advises citric or sulphuric acid, tincture of iron, ergot, and, especially, quinine, with local bloodletting also. Hemorrhage complicating chorio-retinitis adds much to the gravity of the disease, and is to be met by the treatment of the inflammatory condition. *Apoplectiform hemorrhage* is the term given by Abadie to those grave cases in which large amounts of blood are poured out to disorganize the eye. The disease is confined to one eye. It is apt to be painful. Quinine shows especial power over the retinal bloodvessels in these cases, although it is not suggested that they are of malarial character. Pushed vigorously he believes it mitigates the pain and brings about clearing of the media, but it is well to use also myotics and bloodletting.

For *hemorrhagic retinitis* R. Cross, from experience with it, feels justified in recommending¹ subconjunctival bloodletting. In one case where vision was reduced to 6/60, and medicinal treatment and leeching caused no improvement, free incisions were made into the subconjunctival tissue with strabismus scissors, so as to lacerate as many vessels as possible, and warm fomentations were afterward applied. Next day there was marked improvement, which was steadily maintained until vision was completely restored. This suggestion is probably worthy of careful consideration. No one who has watched the relief of the acute pain of iritis, by the application of the artificial leech to the temple, can doubt that it exerts a powerful influence upon the intra-ocular circulation. It seems probable that the extensive withdrawal of blood from vessels so much more closely connected with those entering the eye would exert a still more positive and a more lasting influence.

Subhyaloid hemorrhage, as it is called when the blood breaks through the limiting membrane of the retina and diffuses itself between that and the vitreous body, is of especial importance because it is particularly liable to cover the region of the macula and for the time abolish central vision. Yet it is capable usually of complete absorption with full restoration of vision. Jack² reports a case occurring in a healthy woman of forty years, where the whole macular region was covered by a hemorrhage three and a half or four times the diameter of the disk. At the end of three weeks vision was 10/200, and a year later it was about normal.

Detachment of the Retina, with increased intra-ocular tension, is usually taken as positive evidence of the existence of an intra-ocular growth. Cheatham, however, reports³ two cases in which detachment of the retina occurred in the course of glaucoma, the eye having been examined ophthalmoscopically and the increased tension recognized before the

¹ Ophthalmic Review, July, 1898.

² Boston Medical and Surgical Journal, May 26, 1898.

³ Annals of Ophthalmology, July, 1898.

retina became detached. One of these was the case of a boy of sixteen years when first seen, whose history indicated that glaucoma had existed for three years previously. Two months later the whole retina became detached. After this he was under observation for more than three years, but the eye gave no other indication of an intra-ocular growth. The possibility of encountering such a condition would not justify the treatment of any case which presented retinal detachment with high tension when first seen as other than one of intra-ocular growth.

Horstmann¹ reports that among 106 cases of spontaneous detachment of the retina, the tension was normal in 60, diminished in 46, and increased in none. He reports these cases particularly on account of the final results attained and their bearing on treatment. Thirty-five cases were under observation long enough to determine the final results. Of these 5 showed spontaneous total recovery, 2 reattachment with permanent defect of the field, 2 temporary reattachment but relapse later, 11 detachment remaining partial, and in 15 the detachment became total. This percentage of recoveries is unusually high, even if reckoned on the basis of the whole 106 cases. The cases of complete recovery presented these features: The detachment was in the upper part, flat, occupied less than half the retina, and did not include the yellow spot. No laceration could be discovered with dilated pupil. The subretinal fluid did not sink, but was gradually absorbed in from two to ten months. The detached portion was never entirely insensible. The age of four patients was seventeen to twenty-five years, the fifth, forty-eight years. The eyes were all myopic, 4 to 7.5 D., with rather well-defined crescents.

TREATMENT. Horstmann briefly reviews the various methods of treatment that have been practised, and concludes that Samelsohn's, by diaphoresis, decubitus, and the pressure-bandage for three or four weeks or longer, promises the best results. "All operative methods of treatment that have hitherto been tried are to be deprecated. Those implicating the retina and vitreous are most fraught with danger, whereas paracentesis of the subretinal space, by a puncture of the sclerotic and choroid, is least prejudicial. The prophylactic and curative treatment of the primary difficulty, the uveitis, remains of paramount importance."

The above estimate would probably have the general approval of the great majority of experienced ophthalmologists, still a disorder so apparently mechanical is a continuous challenge to surgical therapeutics, and new modes of operative procedure will doubtless continue to claim attention until success is attained or the necessary reasons for failure are better understood. At the New York Academy of Medicine Sutphen²

¹ Archives of Ophthalmology, September, 1898.

² Ibid., March, 1898.

presented a patient with perfect vision and visual field, upon whom he had operated in 1887 for complete detachment of the retina by puncture of the sclera and retina. The patient remained in bed a month after the operation. The patient's other eye, treated for the same condition in the same way, had subsequently relapsed. Kronheim¹ reports five cases out of twenty-one as cured by scleral puncture, and one of these had been examined over six years and another fifteen months after the operation.

J. O. Stillson² reports five cases of detachment of the retina operated on by multiple puncture of the sclerotic with the galvano-cautery, with four recoveries and one negative result. In the successful cases the duration of the detachment had varied from two to ten months. The galvano-cautery had previously been tried by others and abandoned; hence Stillson's special manner of using it, to which he attaches importance, is of interest. The location and size of the detachment are to be studied by the direct method with the ophthalmoscope. "The head is to be tilted to one side and then the other until the most dependent position is determined; this is the location of the first puncture. The second is made in or near the edge of the detachment if it be large or even well in it, usually not in the sound retina when the detachment is small, and yet far enough away to get the beneficial mechanical effect of a vent. The further object of two punctures is to avoid making one very large and to facilitate gradual and prolonged filtration of the fluid out of the subretinal space. The openings are made with the galvano-cautery plunged directly in at right angles to the sclerotic, and not in such a way as to form a valve. The point, which is white or red hot, should be held a moment in place without turning off the current, and then gradually withdrawn. This burns a round hole which will not close as rapidly as one made with a knife." Stillson has seen the puncture remain open for as long as ten weeks.

TOXIC AMBLYOPIAS.

Quinine Amaurosis. A very important contribution has been made on the pathology of this affection by W. A. Holden,³ who reports careful microscopic studies of the retinas, optic nerves, tracts, and centres of dogs killed at various periods after the production of experimental quinine blindness. Half an hour after a toxic dose is given to the dog the retinal vessels become greatly constricted and vision is completely lost.

After two or three days a fair degree of vision returns, as a rule, and

¹ Deutsche med. Wochenschrift, May 5, 1898.

² American Journal of Ophthalmology, May, 1898.

³ Transactions American Ophthalmological Society, 1898.

remains unless another dose is given. In man the drug usually acts more slowly. Ellett¹ reports the case of a medical student who took the quinine on Monday, 120 grains in twelve hours; he was completely deaf, but recovered in a few hours, and felt no eye symptoms until Thursday, when there was a little burning and smarting. Friday the sight was greatly impaired when he awoke in the morning, and by 1 P.M. he had lost all perception of light, and did not regain it for three months. His sight slowly improved, but two and one-half years later vision was only 5/200 and 1/200, and he was color-blind, with greatly restricted fields of vision. A. T. Mitchell² reports a case in which 240 grains were taken in thirty hours, at the end of which time the patient had lost light perception. She subsequently recovered vision of 20/30.

Ball³ reports a case in which 60 grains were taken in twelve hours, and the patient was completely blind the next morning. On the third day he had light perception in one eye and could count fingers at four inches with the other. After ten months vision was 20/30 and 20/20, with greatly restricted fields.

Holden found in the dog's retina, on the third day after several toxic doses had been given, degenerative changes in a few ganglion cells (vacuolation, paleness, absence of chromophilic granules, and breaking down of the cell body), and a deposition of large globules of a myelin-like character in the nerve-fibre layer. On the ninth and seventeenth days more ganglion cells were found affected and more myelin globules were present. On the seventeenth day the first changes in the optic nerve were noticed, consisting in a breaking down of the medullary sheaths of some of the fibres. On the forty-second and forty-seventh days the ganglion-cell layer and the nerve-fibre layer had almost disappeared from the retina, leaving large cavities, and the myelin globules were no longer present. Many fibres of the optic nerve were broken down, and the degeneration of the nerve could be traced up to the termination of its fibres in the external geniculate body and pulvinar. The ganglion cells of the external geniculate body were normal, and no signs of degeneration were found elsewhere in the brain or spinal cord.

Quinine amaurosis depends, then, on degeneration of the nerve-fibre and ganglion-cell layers of the retina, due, apparently, to insufficient nourishment because of constriction of the retinal arteries. This degeneration is followed by an ascending atrophy of the optic-nerve fibres. The outer layers of the retina, which are nourished by the choroidal vessels, apparently do not suffer. As de Schweinitz says:⁴ "The gaps in our knowledge of the pathogenesis of experimental quinine amblyopia

¹ Journal of the American Medical Association, October 1, 1898.

² New York Medical Journal, July 2, 1898.

³ Ophthalmic Record, October, 1898.

⁴ Ibid., August, 1898.

have now been filled with one exception, namely, the primary contraction of the retinal vessels which causes the ischemia."

This contraction of the retinal vessels appears to be a matter of great practical importance, and overcoming it is the first and most important indication for the treatment of the condition. Ellett tried inhalations of amyl nitrite, but his case was then of two and one-half years' standing. He found that by the inhalations vision was temporarily doubled, but there was no permanent improvement. Such inhalations were tried by de Bono several weeks after the production of experimental quinine blindness; but, naturally, in the light of Holden's investigations, they did no good. Holden¹ injected sodium nitrite within three hours after the quinine, repeated the dose in three hours, and thereafter three times a day. The dog was killed after three days, and the retinas showed typical changes, as well marked as those found in a dog killed after the same period to which no nitrites were administered.

Tobacco Amblyopia. That excessive use of tobacco is alone capable of causing the form of impaired vision characterized by central scotoma, absolute for colors and relative for form, is now well established by the report of cases from time to time in which other unfavorable influences could be excluded. A case of this sort is reported by Hale.² It was of five months' standing, and central vision was reduced to 6/36 and 6/18. Cessation of the use of tobacco and increasing doses of strychnine hypodermatically up to one-fifth of a grain once a day (which produced no physiologic effect), improved the patient's vision to 6/5 in about two months. In severe cases the treatment must be continued longer. Bruns³ reports a case in which the sight had been weak only two months, but was reduced to 20/100 and 20/400. After five months he secured vision of 20/20 and 20/30. One of Ellett's⁴ cases had been suffering six months, and had vision of 20/200 and 3/200. Seven months of treatment brought it up to 15/20 in each eye. A. H. Thompson⁵ reported a case in which vision was reduced to 3/60; no noticeable improvement took place for a year, during which the patient declared he had not smoked at all, yet by the end of the second year perfect vision was restored to each eye.

Amblyopia due to tobacco alone commonly occurs after the age of fifty years, but in connection with alcohol it is caused earlier. M. W. Zimmerman⁶ reports six cases, in all of which alcoholism was an important feature, and five of these were aged from thirty to forty years. Ellett's

¹ Archives of Ophthalmology, November, 1898.

² Medical News, September 3, 1898.

³ American Journal of Ophthalmology, October, 1898.

⁴ Journal American Medical Association, October 1, 1898.

⁵ Royal London Ophthalmic Hospital Reports, vol. xiv., Part II.

⁶ Annals of Ophthalmology, October, 1898.

patients, aged twenty-six and twenty-eight years, were steady and excessive drinkers. An entirely exceptional case is reported by Lautenbach.¹ A schoolboy, aged thirteen years, a cigarette smoker, who had never used alcohol, presented the typical symptoms and history of increasing loss of sight for a year. Vision was raised in four months to about normal by stopping tobacco and pushing treatment.

Amblyopia from Other Causes. LEAD-POISONING. G. E. de Schweinitz² reports two cases of partial optic-nerve atrophy and central scotomas apparently due to chronic lead-poisoning. Beside the central scotoma there was narrowing of the periphery of the visual fields. In one case failure of vision was gradual, in the other sudden.

Elschnig says³ that no part of the visual tract escapes the toxic influence, and only in very mild cases does improvement occur. Retrobulbar neuritis is frequent, and may begin with central scotoma or narrowing of the peripheral field. The ophthalmoscope at first shows nothing, but later signs of atrophy appear.

H. H. Folker reports five cases among the employés in a pottery district; and in all cases the failure of vision was sudden. One case responded to treatment and improved; the others all became totally blind, with intensely white optic disks.

ANILINE DYES. C. A. Veasey reports⁴ a case of central amblyopia in a dye-worker, probably produced by inhalation of aniline dyes. There was a large fan-shaped central scotoma for red and green in each eye, the fields were narrowed peripherally, but central vision was 5/5, although very foggy.

TEA DRINKING. R. K. Campbell⁵ reports a case of amblyopia apparently due to excessive tea drinking. Vision was reduced to 6/36, but improved to 6/9 in each eye four months after restricting the amount of tea used.

IODOFORM AMBLYOPIA. A. Critchett⁶ places on record a case of iodoform amblyopia. The patient had cancer of the breast and had been applying iodoform to the ulcer, when extreme amblyopia developed somewhat suddenly. She lost the power of recognizing any color except blue, for which there was a large central scotoma. The iodoform was then stopped, and in ten weeks she could again recognize any color by indirect vision, though a large central scotoma still remained.

AMBLYOPIA FROM AUTO-INTOXICATION. H. B. Young⁷ reports four

¹ Journal American Medical Association, October 1, 1898.

² Ophthalmic Record, June, 1898.

³ Ophthalmol. Klinik., May 5, 1898.

⁴ American Journal of Ophthalmology, May, 1898.

⁵ Lancet, March 12, 1898.

⁶ Ophthalmic Review, June, 1898.

⁷ Journal American Medical Association, October 1, 1898.

cases, and refers to two others in which hysteria was probably present. The ages of the patients ranged from ten to sixty-three years, and five, including the two regarded as hysterical, were males. In each case there was very marked amblyopia affecting both eyes, without distinct limitation of the field of vision, and impaired color-perception without distinct color scotoma. There were no marked ophthalmoscopic changes. Each patient suffered from obstinate constipation, loss of appetite, and disordered digestion, and a peculiarly foul odor of the breath was present. Calomel given to free purgation produced foul-smelling discharges, and in each case marked improvement both in vision and in general condition followed. In the worst case light-perception was lost, and the pupils were dilated and irresponsive to light. Light-perception and the reaction of the pupils returned on the third day, and a month later vision was normal. This patient had a relapse seven months later, in which vision fell to 20/70, but was restored to normal by the same line of treatment.

THE OPTIC NERVE TRACTS AND CENTRES.

Hemianopsia. The well-known clinical facts of hemianopsia settled the question in man of the semi-decussation of the optic-nerve tracts in the chiasm while the anatomists were still quite divided on the subject. Nevertheless, it is satisfactory to have anatomical confirmation. Dimmer¹ had the opportunity, six weeks after the enucleation of a healthy right eye, to make a microscopic study of its effect on the nerve, chiasm, and tract. Marchi's method showed the right nerve degenerated, the left normal; in the right tract moderate, and in the left extensive, degeneration, while the chiasm showed in some parts the normal, in others the degenerated fibres, and in some parts the two intermingled. To settle this same question von Soelder² has resorted to counting the nerve fibres in the optic nerve, the optic tract, and the chiasm. If, as von K  lliker had still claimed, there was a complete decussation at the chiasm, a sagittal section of it should show as many fibres as are contained in both the optic nerve and the optic tract. This was not found to be the case, the chiasm containing many less than the sum of the other two. The relation of their areas was found to be about thus: nerve 6, tract 8, chiasm 9. This agrees with what Dimmer found, that it is somewhat more than a half-decussation, and also agrees with the relative sizes of the "half" fields. Apparently we are justified in regarding von Bechterew's³ recent prophecy as fulfilled, when, from a review of the clinical and physiological

¹ Bericht. u. d. xxvii. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

² Wiener klin. Wochenschrift, October 20, 1898.

³ Neurolog. Centralbl., March 1, 1898

evidence, he judged the day not distant when the present conception as to the optic fibres would become a fixed scientific fact, and further discussion of the question would be regarded as uncalled for.

A difficult point in working out the scheme of optic tracts and centres was raised by the fact that in general the line, dividing the seeing from the blind half of the field, in lateral hemianopsia, passed around the fixation-point several degrees to the blind side. Thus whichever side of the field was lost, the fixation-point escaped. This comes out in a most striking manner in *bilateral homonymous hemianopsia*, in which both halves of the field are lost, yet a small central field escapes or soon recovers sufficiently to afford useful vision. A case of the kind is reported by A. R. Amos.¹ A woman, extremely anæmic from uterine hemorrhages, suffered from right hemianopsia. Subsequently, after an operation for uterine fibroids, she became entirely blind, but still later vision returned in a central field not over 5 degrees in diameter, in which, nine months after her second attack she had vision of 20/60.

Laquer² also reports, with autopsy, a case in which the central field, only 1 degree wide and 2 degrees high, possessed vision of 3/4. Left hemianopsia occurred first, and right six weeks later. The autopsy showed thrombosis of a medial branch of the left posterior cerebral artery, but on the right side the affected vessel was not found. Elaborate schemes have been devised to account for this retention of vision at the fixation-point, but the simplest explanation, that the macula receives fibres from both cerebral hemispheres, and that the cortex connected with the macula has an especial power to resist injurious influences, perhaps by a double vascular connection, seems the most reasonable. This explanation is favorably regarded by Manz,³ who records further details regarding a case previously reported by Knies and one by Schmidt-Rimpler,⁴ who reported the first autopsy on such a case.

Material variations in the line separating the blind from the seeing field are encountered in typical hemianopsia, and it may be complicated by lesions in special situations, especially about the chiasm. Uthoff⁵ records a case which is probably of the latter class. A woman with exophthalmic goitre and bilateral ophthalmoplegia interna, presented a left homonymous hemianopsia, but in the left eye the boundary bent so far to the left that the seeing field extended beyond the physiological blind spot, while for the right eye the boundary was more nearly the usual form, except that at the upper part of the field it turned almost horizontally to the right, so that the blind encroached upon the upper

¹ American Journal of Ophthalmology, June, 1898.

² Bericht. u. d. xxvii. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

³ Archives of Ophthalmology, September, 1898.

⁴ Erkrankungen des Auges im Zusammenhang mit Andernkrankheiten. Wien, 1898.

⁵ Deutsche med. Wochenschrift, March 17, 1898.

part of the seeing field. Irregular limitations of the fields and bitemporal hemianopsia, explained by pressure on the chiasm and adjoining portions of the optic tracts, have of late years been found in connection with acromegaly. A case of this kind is reported by E. A. Lawbaugh.¹

Visual Hallucinations in Ocular Disease is the subject of a paper by Uhthoff.² These may arise in connection with opacities in the vitreous, or may occupy the blind portion of the field in hemianopsia or optic atrophy, or in the scotomas due to choroiditis affecting the same portions of both fields. Dorr, in discussing this paper, narrated the case of a patient who, after prolonged residence in an asylum for the insane, was cured of hallucinations by the enucleation of the affected eye.

Word-blindness, existing for a time without any other cerebral symptom, is reported by J. Hinschelwood.³ The smallest letters were read singly with ease, but only a few short words, as "the," "to," "of," were recognized by sight, although by spelling them aloud the words could be recognized. This symptom was the only one remaining a few days after an epileptiform seizure. The patient read numbers fluently, not only singly, but in groups, as thousands or millions, or as complex fractions. Later weakness of the right arm and leg appeared, and aphasia, which became complete; he died nine weeks afterward. The lesion was probably a progressive thrombosis of the left Sylvian artery. Hinschelwood points out the ease with which such a condition is recognized, the patient showing good vision (6/8 in this case) with the test-letters for distant vision, but being quite unable to read the usual tests, even the largest type, for near vision.

THE CRYSTALLINE LENS.

Cataract. TRAUMATIC CATARACT due to pressure of the obstetric forceps during delivery must be a very rare accident. E. S. Peck⁴ reports a case to which he was called immediately after labor. The forceps had been applied high up, with the blade across the right eye. There was a large subconjunctival hemorrhage in the lower cul-de-sac, the eye was soft and flattened, the cornea steamy, and the pupil, somewhat dilated, was seen to change from a dull grayish reflex to a dense white in about twenty minutes. The sclero-corneal coat was not ruptured. In forty hours the eyeball was spherical, the tension normal, the swelling of the lids gone, and the milky white cataract could be readily seen. The corneal opacity still remained on the ninth day, but by the thirty-third the cornea was normal. At five and a half months

¹ Ophthalmic Record, July, 1898.

² Bericht. u. d. xxvii. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

³ Lancet, February 12, 1898.

⁴ Medical News, November 26, 1898.

the ophthalmoscope showed red fundus reflex, but there remained some flakes of lens opacity. Seven years later the eye showed a divergent strabismus, but had vision of 20/70, improved to 20/50 by a + 1. D. lens. The pupil was quite normal.

CONGENITAL CATARACTS. D. Gunn finds, often present the appearance of a mere wafer of calcareous lens substance at the centre of a capsule of normal size but collapsed antero-posteriorly. Whether the lens has shrunk after developing, or whether it has suffered as a whole when very small and the capsule has continued to grow under the traction of the suspensory ligament, he is unable to say. The results of operations upon such cataracts have been very unsatisfactory, several eyes being lost altogether, so that Gunn now does a preliminary iridectomy which gives a clearer idea of the condition of the lens to be dealt with, as the pupil is not well dilated by atropine. Lamellar cataract he finds to be much less frequent among congenital cases than the form above referred to.

ANTERIOR POLAR CATARACT. As bearing on its pathogenesis Treacher Collins¹ has reported one case where contact of a sarcoma with the antero-lateral surface of the lens produced just such an opacity, and another of large anterior polar opacity with extensive degeneration of the lens fibres beneath, which may have been produced by prolonged contact of the lens capsule with the cornea. In several cases there was, beneath the anterior polar opacity, another opacity situated a little deeper in the lens, the two separated by normal lens fibres. In all of these the cataract had formed in early life, and several years had elapsed before the patient came under observation. He thought the two masses had been in contact at one time and were separated by the gradual growth of new lens fibres inward between them.

TETANY AND THE CAUSATION OF CATARACT. A. Peters, in a monograph, seeks to connect these conditions and reports two cases of tetany in which cataract also existed, the patients being younger (aged thirty-six and forty years) than is usual among those affected with senile cataract. He thinks the supply of fluid to the lens may be reduced by spasm, causing a shrinkage of the nucleus. Rickets, to which has been ascribed the occurrence of juvenile cataract, may act, he thinks, by predisposing to tetany.

CATARACT AMONG GLASS-BLOWERS. This is again discussed by Hirschberg.² The skin of the face becomes reddened and hardened, especially on the side most exposed to the strong heat, and it is the corresponding eye that is first affected by cataract. Out of thirty men employed by one firm, of five who had reached the age of forty years, all had cataract, and in two of them it was mature. He has noticed in

¹ Ophthalmic Review, June, 1898.

² Centralbl. f. Augenheilk., April, 1898.

India, as among the glassblowers, that it is the patient of forty years who has a cataract ready for extraction, instead of sixty years, the usual age in Berlin. The time required for the development of cataract by heat is so great that it cannot be studied by experiment on the lower animals. The opacity appears first in the posterior part of the lens, and at first progresses very slowly. Recovery after operation is as satisfactory as in those of similar age who are not glassblowers. Hirschberg believes that cataract could be prevented by proper protection from the excessive heat, but the necessary mask is regarded as inconvenient, and a man of twenty-five years will not wear it to escape what seems to him a remote danger of cataract at forty years.

SENILE CATARACT. The attempt to connect this with diseases of other organs, or constitutional conditions apart from diabetes, has thus far yielded but meagre results. Frenkel¹ publishes a study of "renal permeability," made by noting the beginning and completion of the elimination of the dye or the chromagen formed in alkaline urine, when 1 c.c. of a 5 per cent. solution of methylene-blue has been injected deeply into the gluteal muscles. Among 32 cataract patients he found the commencement of the elimination delayed in 18, and the completion of elimination delayed in 24. A reason for this delay, he thinks, may be the sclerotic changes that accompany age, which are probably greater in cataractous persons. The standards of "normal permeability" are so indefinite, particularly for aged persons, that such observations carry but little weight.

MISCELLANEOUS. Concerning the frequency of *diabetic cataract* Williamson² found in 100 cases of diabetes, 9 cases of cataract.

The frequent dependence of cataract upon *eye-strain* and choroidal lesions is emphasized by Risley,³ who also points out that even if the proper treatment for these conditions does not entirely arrest the progress of the cataract, the eye is put in condition to obtain a better result when operation becomes necessary.

SPONTANEOUS RECOVERY. A case of transient opacity of the crystalline lens is reported by Randall.⁴ It was due to a bruise of the eye. The lens was subluxated, and presented opacities at the anterior pole, with vague streaks in the lens periphery. In two weeks the lens had cleared. Randall's patient was a small boy, and such recoveries from traumatic opacity of the lens are most likely to occur in children, although they are not very rare in adults. M. Bondi⁵ reports a case in

¹ Archives d'Ophthalmol., July, 1898.

² Diabetes Mellitus and its Treatment. Edinburgh, 1898.

³ Annals of Ophthalmology, April, 1898.

⁴ Ophthalmic Record, February, 1898.

⁵ Wiener klin. Wochenschrift, March 31, 1898.

which a small foreign body passed entirely through the crystalline lens and lodged in the retina without causing any general opacity of the lens. In a few cases of senile cataract the lens changes go on to complete softening and absorption of the lens, or to absorption so nearly complete that useful vision is restored. Nathanson¹ reports three cases of this kind observed by him. He concludes from these that it is a process requiring ten or twelve years for its completion. F. W. Marlow² also reports a case of the kind. One eye had been operated on for cataract, and the patient, satisfied with this, let the other go untreated. Ten years later the lens was entirely absorbed except the small nucleus, which was dislocated into the anterior chamber. A case in which the lens may be regarded as in the course of absorption is reported by C. D. Wescott.³ A woman of seventy-three years, operated on for cataract, was found to have the whole lens soft, about the consistency of pus. Absorption may, however, be accomplished in much less time than it took in these cases.

Cases of this kind, rare as they are, with the confusion of other conditions with cataract, furnish a sufficient basis for the operations of modern quackery in the direction of "absorption cures for cataract." J. E. Jennings⁴ investigated the claims of one of these, and found the proprietors unable to produce any valid evidence of its efficiency and unwilling to assist in having it tested.

Cataract Operations. The most important question as to the extraction of senile cataract that has largely claimed the attention of operators during the last few years has been that of iridectomy. The operation of Graft, more or less modified in many ways by individual operators, but always including an iridectomy, had been almost universally adopted, when largely, through the practice and teaching of Knapp, the "simple extraction," or extraction without iridectomy, was again brought into common use, and still seems to be gaining ground. Although there has been no special advocacy of it in the last two or three years, as de Saussure⁵ says "the disposition to perform simple extraction continues to be very general, or, perhaps, the procedure has found more advocates."

There is no tendency, however, on the part of anyone to abandon simple extraction with iridectomy. In the practice of the great majority of ophthalmologists the two operations are taking their places side by side, each as the best for the class of cases to which it is especially adapted. The question now is rather one as to the limits of the

¹ *Trans. N. York Acad. Med.*, April, 1898.

² *N. York Med. Journal*, January 14, 1899.

³ *Optician*, Nov. 2, 1898.

⁴ *Trans. N. York Acad. Med.*, November, 1898.

⁵ *Optician*, February, 1899.

class of cases to which each operation is the more appropriate, and in this individual judgment will always vary. As indicative of these variations, it may be noted that the last report of the Wills Eye Hospital, of Philadelphia, shows 87 simple extractions and 91 with iridectomy. The New York Eye and Ear Infirmary reports simple extractions, 109; with iridectomy, 33. In Fuch's clinic, in Vienna, among 400 cases, 206 were done with iridectomy. The last report for the New York Ophthalmic and Aural Institute gives simple extractions, 147; extraction with iridectomy, 14. This last proportion is, perhaps, one extreme of the present practice, while at the other extreme are a few operators who never do simple extraction.

The most serious drawback to simple extraction is *prolapse of the iris*. Not that prolapse is at all a fatal accident, for if it be promptly excised the eye is in much the same condition as though iridectomy had been done as part of the original operation, and with about as good chances of satisfactory recovery. Even if the prolapse be not excised it ultimately flattens down, and the eye becomes quiet and useful, and as safe as an eye upon which iridectomy has been done; but the iris has become incarcerated in the angles of the corneal wound, a condition more frequent after iridectomy than is prolapse after simple extraction. Prolapse, however, defeats the attempt to secure the benefits of a normal pupil, protracts the healing if let alone, or it compels operation on an inflamed eye, which is painful unless done under general anaesthesia. There is good reason, then, to try to avoid prolapse.

Schweigger,¹ to prevent this accident, makes a valve-like vent in the iris. After the delivery of the lens he introduces a drop of tropacocaine into the anterior chamber to secure complete anaesthesia and to prevent reflex contractions of the eye muscles which render it impossible to make the little incision with accuracy. The iris is then pulled forward with fine forceps, and a broad needle is pushed as far peripherally as possible through the iris, and the incision is extensively widened toward each side. A drop of eserine (physostigmine) is instilled into the eye in order, by contraction of the sphincter, to keep the incision in the iris from closing too soon. This instillation can be repeated at each dressing of the eye, if not contraindicated. The incision in the iris generally closes completely and without leaving a trace. In one hundred extractions done with this incision of the iris, Schweigger has seen only two prolapses of the iris that required excision.

Chandler, of Boston, some years ago resorted to what has been called a buttonhole in the iris, a minute iridectomy made as far toward the periphery of the iris as possible, after the delivery of the lens. Standish²

¹ *Archives of Ophthalmology*, May, 1898.

² *Transactions American Ophthalmological Society*, 1898.

says that it seems to succeed admirably, and Pinckard¹ speaks of it with favor.

Schweigger has adopted the *downward incision* of the old flap operation. The idea that the upper incision is held in better apposition by the pressure of the upper lid he deems an illusion, and points out that when the lids are closed the eyeball normally rolls up so that the whole cornea lies beneath the upper lid. On account of this tendency of the eyes to roll up the downward incision can be more readily watched during the after-treatment. The performance of the operation is also simpler, because the pressure of the cutting edge of the knife helps fixation instead of adding to the difficulty of keeping the eye turned down. The objections to the downward incision, which Schweigger leaves unanswered, are the greater freedom of the upper cul-de-sac of the conjunctiva from bacteria and the possibility of prolapse, with the necessity for iridectomy. He admits that when iridectomy is done the removal of the upper part of the iris is the less disadvantageous. Schweigger makes his incision in the corneal margin, finding no advantage in a conjunctival flap, and he uses the broad-knife, preferring Richter's form. He points out that the readiness with which the direction of the cutting edge of the narrow knife can be changed is a distinct disadvantage; that every alteration of the plane of the incision gives it an irregular form and increases the corneal astigmatism. In returning to the use of the broad knife Schweigger is ahead of many of his contemporaries, for it will soon be more generally adopted. The special advantages of the narrow knife for cataract extraction largely ceased when we began to operate under local anæsthesia.

Fuchs² uses the narrow knife, and makes a large conjunctival flap. The lids are retracted usually by the fingers of an assistant. The delivery of the lens is effected by pressure of the fingers through the lower lid. For an after-dressing both eyes are covered by soft, dry wool pads. No bandage is used, but the operated eye is protected by a Snellen aluminum shield.

IMMATURE CATARACT. Barck finds that the senile lens is coherent enough for a complete extraction, however small the opacity in it. The operation can be done as soon as the patient's vocation or comfort is interfered with, and all procedures for artificial ripening are unnecessary and contraindicated. Alt³ has had the same experience and thinks that to keep a patient who has to earn a living for himself and family waiting until his cataract is ripe is downright cruelty. As compared with ripening operations, de Schweinitz⁴ thinks it is preferable to

¹ Ophthalmic Record, November, 1898.

² British Medical Journal, September 17, 1898.

³ American Journal of Ophthalmology, June, 1898.

⁴ Ophthalmic Record, February, 1898.

extract unripe cataracts and, if necessary, to deal with remnants by secondary dissections.

THE OPERATIVE TREATMENT OF LAMELLAR CATARACT is the subject of a statistical study by Fischer and Marshall.¹ From 260 cases in which needling was practised, they found that suppuration occurred in 3.84 per cent, while it occurred in 1.72 per cent. of extraction cases. Still they find needling, followed, if necessary, by curette evacuation, the best operation, the danger of complications arising being considerably greater than for senile cataract.

DELAYED UNION of the lips of the wound after cataract extraction has been studied statistically by Harlan.² Among 500 extractions performed at the Wills Eye Hospital union had not occurred at the end of five days in 26 cases. In 13 the wound closed in seven days; in 8 more it had closed in fourteen days, and 1 case remained open for each of the following periods: fifteen, sixteen, seventeen, nineteen, and twenty days. The vision obtained varied from $1/5$ to normal. As to possible causes of this delay, Harlan believes the corneal incision was, in general, as well made in the cases of delayed union as in the others. In two cases there may have been vitreous in the wound; in two the dressings were disturbed by the patients in delirium; in two the delay seemed due to prolapse of the iris. In one case adhesion of the iris to the wound, which occurred after several days, seemed to promote cicatrization. In twenty cases there was no known local cause. There was nothing unusual in the dressing. The operation was simple extraction in fifteen, and extraction with iridectomy in the others. Something in the condition of the patients was probably the important factor, and this view is supported by the fact that in two of the patients who had both eyes operated on, union was delayed in both, and in one case in which the wound remained open eleven days after extraction, it had, one month before, remained open five days after the preliminary iridectomy. In treatment Harlan favors a conservative course, and, with the wound cleaned and in good apposition, would be inclined to try atropine and the compress for a month.

G. Valois³ reports a case in which the wound remained open for twelve days, probably from a defect in the corneal incision due to a movement of the patient. At the end of seven days a small fragment of capsule was removed from the wound, but this did not produce any benefit. Two days later the thermo-cautery was applied to the wound, and three days later it closed.

Delay in the re-forming of the anterior chamber after cataract extrac-

¹ Royal London Ophthalmic Hospital Reports, vol. xiv., Part III.

² Transactions American Ophthalmological Society, 1898.

³ Recueil d'Ophtalmol., January, 1898.

tion is reported by Troncavo¹ in two cases. The corneal wound seemed to heal normally but not until the fifth day was there any aqueous in the anterior chamber, and the tension remained low ; the pupil, however, dilated under atropine.

OPEN-WOUND TREATMENT. Some ten years ago there was a lively discussion on the question of "bandage" or "no bandage" in the after-treatment of cataract extraction, and as a result there was a considerable lessening of restrictions put upon cataract patients, and lightening of the burdens laid upon them in the way of "dressings." The most radical of the reformers in those days, however, at least closed the eye with a strip of isinglass-plaster or placed such a strip upon the lids where it was supposed to diminish the ocular movements. A departure more radical than Michel or Chisolm dreamed of is announced by Hjort, of Christiania,² and it commands attention because supported by good reasoning, and now by trial for three years, including 118 cases of cataract extraction in which the results were better than with bandages.

The first principle of aseptic surgery is not to impair the natural safeguards against infection. Hjort points out that for the eye the great safeguards against infection are the natural flow of the lachrymal secretion, which is distinctly germicidal, and the movements of the lids, which sweep away all foreign particles that lodge upon the eyeball, while all forms of bandages or dressings which tend to keep the eye warm and moist favor the development of micro-organisms. This is the case to such an extent that the occlusive bandage has been widely used as a reliable culture-test to demonstrate whether the eye was sufficiently free from infection before operating. Hjort, therefore, has discarded all after-dressings for operations and wounds of the eyeball, except where there has been a recent painful loss of tissue from the corneal surface when the conjunctiva is not infected. He takes care to thoroughly cleanse the eye, especially the folds about the caruncle and in the conjunctival sacs, without the use of any irritating "antiseptic," and since it is extremely difficult to thoroughly disinfect the lashes he always practices complete epilation. Of masks or shields to prevent mechanical injury to the eye, while he considers the wire-gauze as least objectionable because it does not exclude light or air, he is sure they would disturb his own sleep even with normal eyes, and he fears the chance of their becoming displaced and, therefore, does not use them. He reports one case in which the eye was struck on the ninth day so as to cause prolapse of the iris, which was excised, yet the eye did well in the end. In the series of 118 extractions one eye was lost by infection.

¹ *Annales d'Ophthalmol.*, July, 1898.

² *Centralbl. f. prakt. Augenheilk.*, May and November, 1897, and February and October, 1898.

This patient had stillicidium but no blennorrhœa of the sac. The lower lid was relaxed, the punctum everted, and the conjunctiva irritated, and a bacteriological examination showed numerous organisms. One eye was lost from intra-ocular hemorrhage, but this patient, it was afterward found, had nearly died of hemorrhage from extraction of a tooth. The eye was not enucleated for three weeks, yet when microscopically examined it showed no evidence of suppuration nor of necrosis of the cornea, which was pushed forward by the prolapsed vitreous and clot.

RESULTS OF CATARACT EXTRACTION. From his hospital work in Asia, E. F. Neve¹ reports that among 730 cases he had 677 successful results; 37 failed, and 16 left before the result could be known. In his last 200 cases there were 7 failures. He found old iritis very prejudicial. He had 60 cases of iritis, of which 41 recovered, and 13 were left with complete and 6 with partial occlusion of the pupil. There were 5 cases of panophthalmitis and 5 of glaucoma. H. Knapp,² from a review of European and American statistics, concludes that the results of cataract extraction may be put down for uncomplicated cases: failure, 3 per cent.; moderate result, 7 per cent.; good result, 90 per cent. In all cases as they occur: failure, 5 per cent.; moderate result, 10 per cent., and good result, 85 per cent.

Operations for Secondary Cataract. The supposed loss of an eye from glaucoma following an operation for secondary cataract led H. Knapp to write a paper embodying his experience with such operations. This paper was read before the American Ophthalmological Society, and published in its *Transactions* and in *Archives of Ophthalmology*, September, 1898. When the article was in type the patient returned and was found to have vision of 20/100, probably capable of further improvement. Aside from this case Knapp has never lost nor permanently injured an eye by discission of secondary cataract. The 1 to 2 per cent. of cases of glaucoma have some of them yielded to myotics, and the others have been cured by iridectomy. He has found glaucoma and cyclitis occurring chiefly in cases in which the capsule was tough and likely to be torn from its ciliary connections; there is no proof that it arises only in eyes that are predisposed to it. St. Bernheimer³ regards glaucoma following cataract extraction as due to irregular healing, and thinks it can be prevented by good technique. Knapp has practised chiefly the making of a T-shaped or crucial incision, with a sharp, well-proportioned, straight knife-needle. He finds this gives the clearest pupil with the least reaction. Of his last 70 operations, which he reports in tabular form, 64 were of this kind; 5 were done with

¹ British Medical Journal, September 3, 1898.

² System of Diseases of the Eye, edited by Norris and Oliver, vol. iii.

³ Wiener klin. Wochenschrift, April 28, 1898.

forceps scissors, and 1 was a cysto-iridectomy. In 64 the vision was improved; in 5 it remained the same, and in 1, the case before alluded to, it was worse. The average improvement in vision was from 18/100 to 20/50.

Ossification of the Lens. The degenerated and shrunken lens often contains white brittle masses which are more or less calcareous, but true bone replacing the lens is rare. Dunn and Holden report¹ a case in which the eye had been lost by inflammation at the age of three years and was enucleated because it caused sympathetic irritation in the other eye when the boy was nine years old. The lens was of normal size and retained approximately its shape, but the lens substance was replaced by masses of compact bone with Haversian canals and enclosed cavities containing fat.

For the removal of the shrunken calcareous lens from the hopelessly blind eyes which contain them, an operation is sometimes required to improve the appearance of the eye. H. D. Noyes² has employed the following method: With the pupil fully dilated an incision is made entirely across the cornea in the horizontal meridian, using the narrow knife. Iris forceps with projecting teeth are then used to seize the thick capsule and gently pull out the whole lens mass, the tearing of the zonula being aided by a little to-and-fro movement. This operation Noyes has done under an anæsthetic given to full relaxation. The eyes in question have a fluid vitreous, and in this way the danger of prolapse of the iris and loss of vitreous is reduced to a minimum; the resulting linear scar is only perceptible on the closest examination, but the astigmatism it causes makes the incision unsuitable for cases in which restoration of vision is sought.

VITREOUS HUMOR.

The Hyaloid Canal and its relation to cyclitic exudation has been the subject of an experimental study by A. McGillivray.³ He was able to distend it by colored injections thrown into the anterior chamber. In cases marked by cyclitic exudation, effused lymph passed backward into this canal. He exhibited to the Section of Ophthalmology of the British Medical Association a specimen illustrating this condition. Marcus Gunn said cases of the kind were diagnosticated as persistent hyaloid artery.

CYST OF THE HYALOID CANAL. J. T. Thompson⁴ reports a case where this condition caused disturbance of refraction suggestive of lenticonus posterior, but which, with a dilated pupil, was seen to be separate

¹ Archives of Ophthalmology, September, 1898.

² Transactions American Ophthalmological Society, 1898.

³ British Medical Journal, August 20, 1898.

⁴ Ophthalmic Review.

from the lens, with a surface convex in front and a prolongation directed backward. It looked "like a drop of oil suspended in water," and the fundus details appeared very highly magnified when seen through it.

GLAUCOMA.

Treatment. The interest in this disease and its importance are attested by the additions made to its literature, and the difficulty of the problems it presents may account for the indefinite speculative character of most of these communications. Sidler¹ has made a minute study of seventy-six cases of glaucoma in Haab's private practice, with especial reference to the influence of different therapeutic measures. He finds that in simple and inflammatory glaucoma iridectomy rarely gives bad results; 91 per cent. kept or regained the vision they had before operation. The better the condition of the eye at the time of operation, the more hopeful the prognosis. In 77 per cent. of cases after iridectomy and in 60 per cent. after sclerotomy there was no recurrence of high tension. In hemorrhagic glaucoma sclerotomy was preferred to iridectomy. Of ten cases two were cured and four recovered some vision. Myotics are most useful in the after-treatment, but in no case did they alone permanently check the disease. Sidler thinks the glaucoma patient should be watched for a long time to prevent and cure relapses. He points out that the tension is more likely to be increased at night, and that insomnia is a general attendant of chronic glaucoma.

RESECTION OF THE CERVICAL SYMPATHETIC. Most striking is the proposition of T. Jonnesco² who would cure glaucoma by resection of the cervical sympathetic, removal of the superior ganglion. He reports the performance of this operation in seven cases; once for acute and once for chronic inflammatory glaucoma; three times for absolute glaucoma (inflammatory), and twice for chronic simple glaucoma. The results of the operation, as he reports them, are: Immediate and permanent reduction of the ocular tension in every case; marked or extreme permanent contraction of the pupil even in cases previously subjected to iridectomy; cessation of pain and inflammatory symptoms; decided permanent and progressive improvement in vision in those cases in which vision had not been previously lost. These results are attributed to removal of the ocular fibres which pass through this ganglion to be distributed to the eye. This causes a relaxation of the bloodvessels in the whole region, diminution of tension and secretion in the eye, myosis, and a wider opening of the angle of the anterior chamber. Jonnesco

¹ Beiträge zu Augenheilk., June, 1898.

² La Presse Médicale, June 8, 1898, and Recueil d'Ophthalmol., August, 1898.

advocates his operation, not for all cases, but particularly for those forms which have been least amenable to iridectomy, especially chronic simple glaucoma. If he has devised a cure for these cases, or even if he has only removed them from the domain of the ophthalmologist to that of the general surgeon, he has earned the gratitude of the ophthalmologist.

The idea of a nervous origin for glaucoma is, of course, not a new one. N. J. Weill,¹ on purely theoretical considerations, supports the operation above mentioned. Abadie² theorized upon it and concluded that iridectomy is beneficial by the removal of the nerve plexus it contains, and he predicted that section of the cervical sympathetic was destined to play an important rôle in ophthalmology. Abadie³ reports trial of the operation on a case of hemorrhagic glaucoma in which the other eye had been lost by the same disease in spite of iridectomy. Vision was reduced to light-perception in the temporal field; the media were cloudy; the iris was injected and contained hemorrhages, and the pain was unbearable. Pain was relieved the evening after the operation, the tension soon became normal, and there was a slight gain in light-perception.

Panas,⁴ however, cannot accept the operation in question, and reports seeing a patient in whom, three months after its performance for the cure of glaucoma, the vision was still declining. Experience with the same operation for exophthalmic goitre also indicates that its effects are apt to be but temporary. Hemorrhagic and simple chronic glaucoma are such grave conditions and have such bad prognoses under the usual modes of treatment that it seems right, if after a frank explanation the patient desires it, to try almost any experiment which promises relief. To the list of such justifiable experiments we may admit excision of the superior cervical ganglion. If it fails we can still have recourse to the old standard remedy—enucleation for the relief of pain.

HANCOCK'S OPERATION. The one significant fact definitely established for large classes of cases of glaucoma is the blocking of the channels for the outflow of fluid from the angle of the anterior chamber. The closure of this angle, by adhesion of the periphery of the iris to the cornea, is the most common method of obstruction. Stoefting⁵ suggests that infiltration of the limbus may be another important method. In acute intense glaucoma, produced experimentally in rabbits by ligating the vortex veins, he found this infiltration very marked. The fact that it may be generally relieved by a free incision opening any part of the limbus may explain the number and variety of incisions in this region that have been claimed to give relief.

¹ American Journal of Ophthalmology, January, 1898.

² Ophthalmol. Klinik, November 5, 1897.

³ Archives of Ophthalmology, July, 1898.

⁴ Archives d'Ophthalmologie, July, 1898.

⁵ Bericht u. d. xxvi. Versamml. d. Ophthalmol. Gesellsch. zu Heidelberg.

One of these incisions which achieved a certain amount of reputation soon after the time that Gräfe introduced iridectomy for glaucoma, but which was soon superseded by that operation and largely dropped out of sight, was Hancock's operation. It consisted in plunging a Beer's knife through the ciliary region so as to make a cut in a radial direction, which was supposed to be beneficial because it divided the ciliary body. That it opened the canal of Schlemm completely and the aqueous and vitreous chambers was not taken into account. S. Pollak,¹ having in thirty-eight years performed this operation between sixty and seventy times without a single failure, puts in a plea for it as a mild, quick, and effective surgical procedure for the relief of pain in acute glaucoma, without liability of future recurrence. The advantages he claims for it are: No anæsthetic is required; only one instrument is necessary; the operation lasts but a few seconds, is easy and almost painless; it gives effective drainage without hemorrhage; requires no after-treatment, and the final result is no mutilation and no recurrence, but normal function and appearance. Pollak reports a case which was also seen by J. E. Jennings and A. Alt.

The thought will promptly occur to every ophthalmologist that this operation rudely invades the sacred ciliary region. It is quite possible that fear of the remote consequences of such an invasion may have had much to do with the limited trial this operation had at the time of its introduction and with the desuetude into which it has fallen. Whether there is much risk of sympathetic disease from a clean, smooth radial cut in this region, is doubtful. Cases are met with in which such an operation would be a boon if it could be relied on. In some of them it may be yet worth a trial.

MASSAGE is another old remedy for glaucoma which has recently attracted more attention. J. A. Pratt² reports a case in which it had restored the tension and vision to normal, and Gould states that he has had experience of four cases in which for several years the tension and vision have been kept normal by firm massage with the finger and by means of the lids. It is certainly, in some cases, a valuable palliative.

MYDRIATICS IN GLAUCOMA. Harlan³ has met with two cases in which the instillation of *homatropine* caused *pulsation of the retinal arteries* in eyes which at the time presented no other evidence of glaucoma. One of the patients suffered a well-marked attack of glaucoma a few months later. The other is still under observation. Harlan raises the question: "As the effects of *homatropine* are easily neutralized by *eserine*, might not its application be a permissible means of diagnosis in some doubtful

¹ American Journal of Ophthalmology, March, 1898.

² Philadelphia Medical Journal, December 17, 1898.

³ Ophthalmic Record, January, 1898.

cases?" In discussing the influence of mydriatics and myotics on the glaucomatous eye the belief has been expressed¹ that "it would be perfectly proper, after explaining the matter to the patient and getting his assent to prompt iridectomy, if it should be indicated, to use homatropine as a test for the presence of glaucoma at the earliest stage in doubtful cases." If iridectomy can be promptly done the provocation of a glaucomatous attack by a mydriatic may be cause for congratulation, rather than regret. Probably it can only occur in an eye doomed to the disease, and the earliest application of the remedy gives the best chance for complete and permanent cure. Of course this is no palliation for the ignorant or injudicious use of a mydriatic in a glaucomatous eye.

Influence of Accommodation Upon the Intra-ocular Tension. Hess and Heine² have studied this subject and find it has none at all. Experimenting on apes, which have an accommodation as great as that of the human eye, they used a manometer so delicate as to indicate the change of tension produced by every pulse wave, but the tension was unaffected by the maximum exertion of accommodation. In the human eye, with a pulsating vein, the pulsation was likewise not increased by maximum accommodation. Hess has also pointed out the inconsistency of regarding glaucoma as caused by accommodation, and of trying to cure it with myotics, which cause violent and persistent contraction of the ciliary muscle. The theory that glaucoma is caused by strain of accommodation was never very well sustained, and can ill afford to lose the support of even the unwarranted assumption that intra-ocular tension is increased by the act of accommodation.

Tension of the General Arterial System. This has been studied by Terson and Campos.³ They find it practically normal in acute and in simple chronic glaucoma, but increased in hemorrhagic, and still more increased in subacute glaucoma. In the subacute the general measures useful in high arterial tension may be of service, but in protracted glaucoma the powerful influence of pain on the general condition must not be lost sight of as a possible cause of the increased arterial tension.

Buphthalmos, or Hydropthalmos, is generally recognized to be a congenital form of glaucoma due to obstruction of the angle of the anterior chamber. Collins found the obstruction to be due to failure of the iris to separate from the cornea as it does in the course of normal development, but von Hippel, from examination of the eyes of an infant dying before it was a month old, concludes that the adhesion is due to intra-uterine inflammation. He found extensive destruction of the posterior surface of the cornea, including Descemet's membrane. As this

¹ American Journal of the Medical Sciences, April, 1898.

² Gräfe's Archiv. f. Ophthalmol., vol. xlv. Part II.

³ Archivee d'Ophthalmologie, April, 1898.

membrane is never restored, lesions of it can be discovered by microscopical examination at any subsequent period. Hippel found such lesions in two cases of buphthalmos, and points out that they have been mentioned in seven out of nineteen cases reported by others. Three cases of buphthalmos occurring in one family are reported by W. B. Johnson.¹ The eyes had all been subjected to operation, in two cases by Vincentis, of Naples, and the third by himself. Iridectomy was done in three eyes, and probably sclerotomy in the other three. The operations seemed to have checked the progress of the disease, which had previously been distinctly progressive.

THE EYELIDS.

Tarsitis. H. Gradle² reports a case of inflammation of the cartilage of the right upper lid. There was cedema of the skin over it and moderate hyperæmia of the tarsal conjunctiva and transition folds, and when the patient kept the eye tied up a catarrhal conjunctivitis developed. Although the disease is always a manifestation of syphilis, and a history of syphilis was obtained in this case, the swelling of the lid grew worse while the patient was taking corrosive sublimate and while taking potassium iodide in doses of 4 grammes three times daily, until the swelling was so great that the eye could not be opened spontaneously. Two incisions were made into the tarsus, but no cavity of necrotic tissue was found. The incisions healed promptly, and the cedema of the lid was lessened. An ointment of pyrogallic acid, 10 per cent., was then employed, and marked improvement, noticed within two days, continued for a week, when it became necessary to stop the ointment on account of an abrasion of the skin. Improvement then stopped also. When the skin was healed the ointment was used again with unmistakable improvement of the tarsitis. Another necessary suspension of the remedy brought suspension of the improvement, and a third time its use was markedly beneficial.

G. S. Tennent³ also reports a case of tarsitis in which there was softening and suppuration. The left upper lid was so swollen that it hung 2 mm. over the lower lid and could not be lifted. Syphilis was denied, but the swelling became reduced under large doses of potassium iodide.

The tarsal swelling has been considered gummatous. Gradle points out that there are no anatomical studies of it; that it sometimes appears sooner after infection than gumma would be looked for; that gumma usually yields promptly to potassium iodide, and that gumma has been recognized as a more localized tumor of the tarsus, likely to ulcerate.

¹ Transactions of the American Ophthalmological Society, 1898.

² Ophthalmic Record, March, 1898.

³ Ibid., April, 1898.

Gumma of the Lids, presenting the characteristics just referred to, is reported by L. Gruder.¹ On the right lower lid and the two lids of the left eye there were nine localized reddened swellings, each with an ulcerated surface surrounded by infiltration. Syphilis was denied and the diagnosis rested chiefly on the indolent painless character of the lesions, involvement of the related glands, and the beneficial effect of mercurials.

Chancre of the Lids. R. Gagzow² reports a case of chancre involving both lids at the inner canthus, occurring in a child fifteen months old, infected from the mucous patches on its father's tongue. The induration was not so extreme as in other reported cases, but there was general involvement of the lymphatic glands and secondary symptoms appeared. J. Hellborn³ reports a case of chancre of both eyelids which was also transmitted from mucous patches in the mouth. H. Juler⁴ saw a chancre at the inner canthus in a woman who was nursing a syphilitic baby. The ulcer was not much indurated, but the glands were enlarged, and secondary symptoms developed. When mercury was given the ulcer rapidly healed, but the canaliculi were obstructed by the resulting cicatrix.

Idiopathic Gangrene of the Skin of the Lids and Brow, occurring in three children, aged one, three, and five years respectively, of healthy parents, is reported by B. A. Randall and G. C. Harlan. The youngest child died. It had a deep black slough of the skin of both upper lids and of the root of the nose, which, when removed, left a deep ulcer of the same extent. Both corneas had sloughed and the balls were shrunk. The older children recovered, but suffered a second attack which increased the scarring. The eldest lost the right upper lid, and the deep ulceration on the brow, nose, and lower lid led to keloid scars. Diphtheria bacilli were reported in the discharges from one case. The elder children were attacked while separated from the youngest. They were all well nourished and healthy looking, and the parents robust. They lived in a new, not previously occupied, house, with good sanitary surroundings.

Herpes and Eczema involving the lids in an attack of neuritis of the ophthalmic division of the fifth nerve is reported by J. W. McConnell.⁵ The vesicles of the herpes began to appear within twenty-four hours after the pain. Some days later a fine vesicular eruption occupied the surface between the original large vesicles which were then becoming pustules. After the eruption disappeared the skin was discolored for

¹ Wiener klin. Wochenschrift, September 8, 1898.

² Deutsche med. Wochenschrift, February 10, 1898.

³ Münch. med. Wochenschrift, May 24, 1898.

⁴ Philadelphia Medical Journal, February 12, 1898.

⁵ Ibid., March 19, 1898.

some months, and for nearly a year it was anæsthetic, with a feeling of stiffness and dull pain.

Dermatitis from Mydriatics is reported by F. C. Hotz.¹ The patient had iritis, and a weak solution of scopolamine was instilled because the physician who had treated him for iritis five years previously stated that atropine had caused a violent inflammation of the skin, which the patient said had been worse than the trouble in the eye. The scopolamine solution, used several times, dilated the pupil imperfectly and caused the lids to become red and œdematous. It was replaced by duboisine in stronger solution (1 to 240), used every three hours. This dilated the pupil but increased and extended the swelling of the lids until the whole side of the face was intensely swollen, the skin furrows deep and eroded, while crusts of dried secretions formed everywhere and there was a good deal of discharge from the conjunctiva. After discontinuance of the duboisine the condition of the face rapidly improved.

Ptosis Operations have of late multiplied with great rapidity, each operator usually describing a "modified" operation whenever a case does well enough to be worth reporting. Hirschberg² reports five cases in which paralytic ptosis was due to a revolver wound in the right temple in attempted suicide. He used Birnbacher's modification of Drausart's operation, in which the tarsal cartilage is drawn up by three silk sutures and united to the insertion of the frontalis. The results obtained were quite satisfactory. Van Fleet³ describes a modification of Pana's operation, more simple than the many others which have been described since Pana's first description, thirteen years ago. An incision is made in the lid above the upper margin of the cartilage, across the middle third of the lid or a little longer, and from each extremity of the first incision additional incisions are made to the ciliary border. A last incision, parallel to the first and slightly longer, is made in the brow. The skin included by the first three incisions is dissected up, forming a tongue, and the tissue between the first and last incisions is tunnelled, the tongue thrust through and its free edge united to the upper lip of the last incision by fine sutures. The skin surface thus embedded beneath the brow is said to soon lose its epithelium and unite with the tissue covering it. Wilder,⁴ for complete paralytic ptosis, after shaving the brow makes an incision 40 mm. long down to the periosteum, and carefully dissects up the superficial structures from the tarso-orbital fascia down to the upper margin of the tarsus. He then introduces two sutures so that they take a firm hold on the tarsus, and passes the needles in and out of the fascia like

¹ Ophthalmic Record, November, 1898.

² Deutsche med. Wochenschrift, September 29, 1898.

³ Medical News, January 1, 1898.

⁴ Annals of Ophthalmology, January, 1898.

a gathering-string, finally passing them through the muscle and connective tissue of the upper lip of the wound. The two stitches are then drawn up until the proper elevation of the lid is obtained, cut short, and covered in by uniting the lips of the wound by fine sutures.

Entropion. CAUSTIC POTASH. For senile entropion of the lower lid, S. Theobald¹ particularly recommends its use. He prefers it to removal with the knife because the desired effect can be obtained more exactly with the caustic, and it seems to have a greater mechanical effect from the removal of the same amount of tissue. The crayon of caustic should be sharpened by rubbing it on wet blotting-paper. Pain is lessened by soaking the skin with a strong solution of cocaine for ten or fifteen minutes. Theobald's aim is to produce an eschar, 3 to 4 mm. wide, parallel to the lid margin the whole length of the tarsus. It should not approach nearer than 2 mm. from the lid margin, and, as the action of the caustic tends to extend, the line of its application should be 4 mm. from the lid margin. Along this line the crayon should be drawn back and forth several times until the epidermis is destroyed and the tissues beneath begin to assume a brownish color. The lid is held everted until the action of the caustic has extended as far as seems desirable, when it is quickly neutralized by an acid solution, such as equal parts of vinegar and water. Within a few minutes the eschar begins to contract, and usually when the lid is released the tendency to entropion is found to have been already overcome.

Carl Berek² has modified the cross-bar entropion forceps by making one bar wider, with three little holes in it, and by placing in the narrow bar three little teeth. These firmly hold the lid when the forceps is applied, and the broad blade being applied to the conjunctival surface serves as a support, like a lid spatula, while the narrow blade on the skin surface may be used as a ruler to direct the incision.

Ectropion of the Lower Lid. Argyll Robertson³ describes an excellent modification of the excision and sliding-flap operation. The required incisions are illustrated in Fig. 50. Commencing at the outer third of the lid, about 2 mm. below the margin, an incision through the skin is carried out parallel to the lid-margin, past the outer canthus, then more upward for about half an inch, then horizontally for about a quarter of an inch, and lastly downward, diverging slightly from the upward incision, for about an inch and a quarter. The solid line indicates the course of this incision. The flap or "strap" thus outlined is then dissected up. An ordinary V-shaped piece is now removed from the lid, as outlined by the dotted line, its outer edge being some 3 mm.

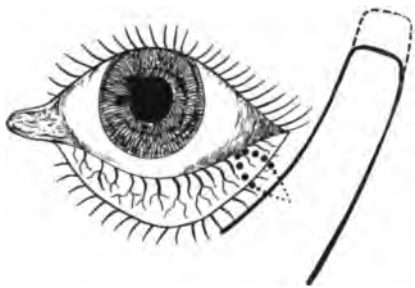
¹ Transactions American Ophthalmological Society, 1898.

² American Journal of Ophthalmology, December, 1898.

³ British Medical Journal, June 11, 1898.

from the outer canthus; this piece should be small, as more tissue can easily be taken afterward if necessary. The "strap" is then drawn upon so as to correct the ectropion. If there is puckering of the edge of the lid, more tissue must be removed at the nasal side of the V-shaped incision. When the lid is made to fit neatly the "strap" is laid upon the skin where it now comes up to the broken line in the figure. This is outlined with the knife, and the skin between it and the first incision (solid line) is dissected off. The strap is then fixed in the space which it just fits by several sutures. By this method the exact amount of tissue to be removed is easily ascertained, and the strap furnishes efficient permanent traction on the lower lid to keep it in position.

FIG. 50.



Argyll Robertson's strap operation.

For complete eversion of the lower lid, A. E. Prince¹ excises the cartilage. The canaliculus is slit and an incision, about 1 mm. within the openings of the meibomian ducts, is made through the conjunctiva the whole length of the lid. From the middle of the tarsus the conjunctiva is dissected up for a few millimetres, after which the tarsus is divided. Each free end is now grasped in turn by forceps, and is dissected out to its extreme limits with tenotomy scissors, care being taken not to excise any of the conjunctiva. No sutures are necessary, the cicatricial contraction shortening the lid so as to bring it up into good position, and the replacement is permanent. The removal of the meibomian glands causes no trouble. The operation is not indicated for minor degrees of displacement, and is useless for cicatricial ectropion.

Chalazion. C. J. Kipp,² for the removal of chalazion of moderate hardness, uses a forceps (Fig. 51) with one blade solid, the other fenestrated or slit. The solid blade is placed on the skin, the other on the conjunctival surface. The lid is everted and the chalazion incised through the slit. The moment the incision is completed the handles are

¹ American Journal of Ophthalmology, May, 1898.

² Transactions of the American Ophthalmological Society, 1898.

compressed and the contents of the chalazion pressed out. This is sufficient without any curetting.

FIG. 51.



Kipp's chalazion forceps.

Powder Stains. For the removal of recent powder stains J. W. Heustis¹ recommends, after the patient has been thoroughly anæsthetized, using a stiff nail-brush to scrub the parts thoroughly with soap and water and such antiseptic as the operator may prefer. The operator need not hesitate to draw blood, nor must he cease before the grains of powder have been entirely removed. If necessary the entire cuticle may be removed, as it will re-form in a few days. The denuded surface may be covered with lint soaked in carbolized oil. This method will be found much more effective than the old plans of letting the superficial grains come away with the epidermis, of applying a blister, or of washing the surface with a strong spray, but it will leave some of the more deeply embedded grains undisturbed. Heustis recommends that each of these be excised. The best way of removing them, however, is to touch all such points with the galvano-cautery at the close of the scrubbing, being careful to employ chloroform and not ether as the anæsthetic.

THE LACHRYMAL APPARATUS.

Tumors of the Lachrymal Gland. SCHIRRHUS CARCINOMA. A case, believed to have had its origin in the lachrymal gland, is reported by Jennings and Alt.² It had caused a noticeable proptosis for twelve years, which slowly increased until the eye was pushed "very far forward and somewhat downward," although retaining vision of 2/40. The tumor was easily removed and the eye returned to normal position, but within a month proptosis was again evident. Within five months evisceration of the whole contents of the orbit was done, and four months later the patient died, the orbit having been filled by a recurrent growth within two months.

AN ANGIOMA OF THE LACHRYMAL GLAND, which was probably congenital, is reported by de Schweinitz.³ It occupied the upper outer part of the orbit, appearing in the skin and beneath the conjunctiva as

¹ Ophthalmic Record, October, 1898.

² American Journal of Ophthalmology, January, 1898.

³ Transactions American Ophthalmological Society, 1898.

a bluish or purplish mass, and apparently consisting of enlarged vessels. The growth and a tapering prolongation extending to the apex of the orbit were dissected out. It was found to consist of lachrymal-gland tissue, invaded and partly replaced by a typical cavernous angioma. The dilated capillaries of the gland tissue could be followed into the expanded blood spaces.

FIBRO-LIPOMA OF THE LACHRYMAL GLAND. C. S. Bull¹ removed from the temporal side of an eye, without much difficulty, a growth that had been noticed for about eighteen months; on examination it proved to be a fibro-lipoma.

SYPHILITIC ENLARGEMENT OF THE GLANDS. Two cases of chronic enlargement, of both lachrymal glands, of syphilitic origin are given by Juler.² They disappeared under the use of potassium iodide. Osler³ reports a case of chronic enlargement of both lachrymal and salivary glands, and collects nine other cases from medical literature. Osler's case had syphilitic rhinitis, and the glands slowly returned to normal size under mercury and potassium iodide.

Diseases of the Lachrymal Passages. **THE USE OF PROBES.** "I advise patients with moderate epiphora to bear it without probing and attend to the conjunctiva and mucous membrane of the nose. I treat acute diseases of the tear-passages antiphlogistically in the first stage, and by cautious syringing and catheterization in the subsequent stages; leave incomplete chronic strictures alone; treat lachrymal fistulæ and chronic dacryocystoblennorrhœa by opening the tear-sac freely, pack it with sterilized gauze for a day or two so as to make a thorough examination, and, if I find the mucous membrane exuberant, I treat it with nitrate of silver in strong solutions, or with the stick, or scrape or cauterize it, trying to restore its structure and function. Failing in this attempt, I obliterate or extirpate the sac." With these words Knapp concludes his account of operations on the tear-passages.

In the same volume Theobald⁴ says: "My experience in the use of large lachrymal probes now extends over a period of eighteen years, and with each succeeding year my belief in the value and efficacy of this method of dealing with lachrymal obstructions has become more strongly established." Knapp uses probes not larger than the No. 6 Bowman (1.25 mm. in diameter), and says of their use that his opinion "concurs with that of Arlt, Czermak, and many others;" also that "in chronic narrowing by cicatricial strictures the conventional treatment by probing is a greater trouble to the patient than the evil. If it

¹ Transactions American Ophthalmological Society, 1898.

² Philadelphia Medical Journal, February 12, 1898.

³ American Journal of the Medical Sciences, January, 1898.

⁴ System of Diseases of the Eye. Edited by Norris and Oliver, vol. iii.

was ~~conductive to a permanent recovery~~, the patient might well put up with the pain and annoyance it causes, but this treatment is at best only palliative." Theobald has used his No. 16 probe (4 mm. in diameter) in about two-thirds of all his cases, including children, and he is "sure that the cases in which a probe at least as large as No. 13 (3.5 mm. in diameter) may not be used with advantage are extremely rare." He also says: "So satisfactory have my results been that there is no class of cases which I now undertake to treat with more confidence than I do strictures of the lachrymal canal."

A divergence of views very similar to the above was manifest in the discussion of the subject before the Section on Ophthalmology of the American Medical Association.¹ Connor, Black, Reik, and Fox had used the large probes to advantage. Risley, in one group of skulls, found that none would admit the passage of the largest probe through the bony canal without fracture, and Reynolds and Allport "detested" large probes. Thompson thought he had cured some cases with the very large probes, but believed the majority would come back in a few years as bad as ever. Others depended chiefly on conservative methods.

It should be borne in mind in connection with Theobald's results that his treatment frequently extends over eight or ten months, but the active treatment, involving the frequent probing, is comprised within as many weeks. The introduction of large probes is "attended by somewhat more pain" than is the introduction of smaller ones, and not infrequently, in cases "cured" with large probes, "when the nose is blown air is apt to find its way through the duct into the corner of the eye." When there is caries of the upper extremity of the duct the divided canaliculus may gradually disappear, so that the opening from the conjunctiva is directly into the sac.

From these various views on the treatment of lachrymal obstruction we may conclude that: To cure by intermittent probing, cases not amenable to milder measures, one must use large probes for several months; it is likely that these cases can be cured with less pain, and perhaps with quite as satisfactory a result, by the continuous wearing of a large style, or by extirpation of the lachrymal sac.

EXTIRPATION OF THE LACHRYMAL SAC. According to Bickerton² this operation is of everyday occurrence at Fuchs' clinic. After a cocaine injection an almost vertical incision is made down to the internal tarsal ligament; this is divided with scissors and the sac dissected out, beginning with the upper end and dividing the mucous membrane lining the duct as low as possible. The cavity is well scraped with a Volkmann scoop, syringed out with a 1 to 1000 sublimate solution; iodoform

¹ Journal American Medical Association, October 1 and 8, 1898.

² British Medical Journal, September 17, 1898.

is dusted in and the edges of the incision are united by silk sutures. To effect a similar cure in all cases of chronic suppurative dacryocystitis, A. E. Prince¹ resorts to the following method: He introduces a probe (or small strabismus hook) through the canaliculus into the lachrymal sac, incises the skin stretched over its point, and enlarges the opening to the entire length of the sac. He then lays open any sinuses that may exist and applies a saturated solution of monochloroacetic acid by means of a cotton applicator over the surfaces of the sac and sinuses thus exposed. The wound is then packed with iodoform gauze and kept packed until healing is complete.

OTHER METHODS OF TREATMENT. In the way of milder measures, H. E. Jones² practices irrigation by gravity, using a silver canula the size of a No. 6 Bowman probe, which is introduced into the canaliculus after slitting its outer half. He uses a *boric-acid* solution, the canula being connected with a reservoir raised six or eight feet above it. *Protargol* has been used with marked benefit in blennorrhœa of the lachrymal sac. Pergens³ used it in 10 per cent. solution. Walter⁴ found that a 20 per cent. solution controlled the secretion in three days. Wicherkiewicz⁵ used a 10 to 20 per cent. solution, which he slowly injected into the sac after having thoroughly cleansed it by syringing with a solution of boric acid. Even one thorough application caused noticeable improvement, the discharge becoming mucus and decreasing. The improvement was especially rapid when the injections were made twice a day. To prevent recurrence the treatment had to be continued one or two weeks after the discharge ceased, and sometimes astringents were required in connection with it to reduce swelling of the mucous membrane.

Miscellaneous. Snell⁶ has seen a case of *chancre of the lachrymal sac*, duly followed by secondary symptoms of syphilis which healed promptly under mercury.

De Schweinitz⁷ reports the removal of a pear-shaped grayish-yellow tumor, 8 mm. long and 4 mm. wide, from in front of the lachrymal sac where it was embedded in the fibres of the orbicularis. It had the usual composition of tuberculous tissue, but no tubercle bacilli were found in it.

¹ Journal American Medical Association, October 8, 1898.

² British Medical Journal, August 20, 1898.

³ Klin. Monatsbl. f. prakt. Augenheilk., April, 1898.

⁴ Ophthalmol. klin., July 5, 1898.

⁵ Ibid., November 5, 1898.

⁶ Ophthalmic Review, July, 1898.

⁷ Transactions American Ophthalmological Society, 1898.

EXOPHTHALMOS.

Exophthalmos: Centre. Although usually causing only a cosmetic defect, exophthalmos of the globe, may be far more serious in its consequences. Oliver¹ reports a case in which both eyes were lost within a few days after the appearance of the first symptoms. Oliver and others report a case in which sloughing of the corneas occurred about a month after the beginning of the attack. To prevent this grave result, stitching the lids together has been recommended. It was resorted to in one of the above cases, but signally failed to be of service. The severe neural pain and irritation of the lids in the first case, and the inflammation sufficiently to protect the cornea in the second. Both patients had the advantages of rest and hospital treatment. In the first case both eyeballs were excised, after all vision was lost, which caused pain and was followed by marked improvement in the general condition, a result already noted in other cases.

It is not clear if the disease involvement of the cornea, from inflammation, is a condition so urgent as to justify the excision of the eyeballs. If excision of the thyroid will lessen the inflammation, and so prevent the impending disaster, it is fully justified. The cases who practiced bilateral excision of the cervical glands have been reported that in one case the exophthalmos was completely, and in the other almost completely. Chronic exophthalmos which is impending are usually approaching a final stage, and scarcely justify similar measures for the relief of the exophthalmos.

EXOPHTHALMOS: CENTRE WITH UNILATERAL EYE SYMPTOMS. Oliver² and others report two cases. In both patients the left eye was affected. One exhibited tachycardia, the other did not. In the latter under the use of antipyrin, 5 grains three times daily, the protrusion of the lid disappeared, but the Gräfe symptom, the failure of the upper lid to follow the movements of the eyeball, continued. This has, Oliver thinks, shows that the latter symptom does not depend on the spasm of the involuntary muscle which causes the lid retraction, but that it is of central origin. In both cases there was some thyroid enlargement. Victor Miller³ reports a case in which only the right eye was involved and the right lobe of the thyroid was enlarged. In four cases of the disease occurring in the children of one

¹ Ophthalmic Review, July, 1898.

² Annals of Ophthalmology, April, 1898.

³ British Medical Journal, June 25, 1898.

⁴ Ibid., September 3, 1898.

family, reported by B. Holmes,¹ exophthalmos was absent and no mention is made of other eye symptoms.

Exophthalmos with fixed, partly dilated pupils, is reported by H. B. Palmer² as a prominent symptom in a case of *cocaine poisoning*. A. J. Shaw³ reports a case in which spontaneous hemorrhage into the orbit caused the left eye to protrude half an inch forward and slightly downward. Teillais,⁴ from a study of sixty-two women at the menopause, thinks there is at this period a *transient exophthalmos* of vascular and, especially, venous origin. It is not attended with other symptoms of exophthalmic goitre. This is different from the intermittent exophthalmos which sometimes alternates with enophthalmos, and which is due to enlargement of orbital veins. Vossius⁵ has collected twenty cases, fourteen of which were in men, and he finds that it is always unilateral. The exophthalmos is developed by stooping forward, forced expiration, or by pressure upon the jugular veins.

A case of transient exophthalmos with bruit but without pulsation, which ended in spontaneous recovery, is reported by Coggin.⁶ It was accompanied by transient ophthalmoplegia externa and more permanent paralysis of the external rectus. The bruit was distinctly heard over the eye and temporal fossa, and ceased upon pressing the common carotid. It was heard by the patient but she forgot to mention it until questioned. It lasted, from her account, nineteen days. Ellett⁷ reports a case of bilateral exophthalmos due to non-suppurative tenonitis.

TUMORS OF THE ORBIT.

Dermoid Cyst. A case which greatly affected the development of the eyeball and orbit is reported by H. Moulton.⁸ The patient was thirty-two years of age and the tumor had been gradually increasing from his earliest recollection, though only recently had it become painful. It presented below the eye and extended on the cheek. The eyeball, less than two-thirds the normal size, was crowded up behind the outer end of the upper lid, was slightly mobile, with cornea normal but turned up; the patient could count fingers at two feet with this eye. The diameters of the orbit were: vertical 45 mm., horizontal 47 mm., while the diameters of the other orbit were 30 and 37 mm. respectively.

Cystic Tumor. Norris⁹ encountered in a girl of twelve years a

¹ Philadelphia Medical Journal, June 11, 1898.

² Lancet, March 12, 1898.

³ Ophthalmic Record, January, 1898.

⁴ Annales d'Oculistique, June, 1898.

⁵ Bericht. u. d. xxvi. Versamml. d. Ophthal., Geselsch. zu Heidelberg.

⁶ Archives of Ophthalmology, January, 1898.

⁷ Ophthalmic Record, May, 1898. ⁸ Ibid., March, 1898.

⁹ Ibid., January, 1898.

tumor which presented at the upper inner angle of the orbit, forcing the eye downward and outward. Pressure on the tumor caused the eye to project and rendered the eye more prominent. Risley¹ records a similar tumor presenting below the orbit near the nose, but evidently connected with a deeper orbital cyst from which it could be cut off by firm pressure on the orbital margin. A. H. Griffith² reports an *orbital cyst* 21 x 15 mm. in its diameters, causing exophthalmos when pressed upon and probably arising from the capsule of Tenon.

Cavernous Angioma. C. H. Usher³ reports a case in which the growth was situated within the cone of the ocular muscles, causing exophthalmos and reduction of vision to light-perception.

Lipoma of the Orbit. A case is reported by Gruening⁴ which presented along the lower rim of the orbit as a roundish, soft, elastic body.

It had been noticed at the age of fifteen years, or twenty years previously, and appeared first in the lower lid, though it later involved the upper. It was removed for merely cosmetic indications, and was found to be 28 x 18 x 5 mm. in size, and composed of fat cells enclosed in a capsule; it was slightly more dense than orbital fat, which it otherwise resembled. Knapp⁵ had a similar case although the tumor was much larger. Buller⁶ records a case of extensive lipoma of both orbits, which remained stationary for many years until the patient's death.

Sarcoma. An enormous fibro-sarcoma of the right orbit was removed by F. M. Wilson.⁷ The tumor had been noticed for twenty-three years, but had grown chiefly in the last three years and had been painful for the last month. The part external to the orbit was roughly spherical, and two and five-eighths inches in diameter (see Fig. 52). The most prominent part was the cornea, but the patient kept the upper lid stretched over this most of the time. The cornea was opaque but the eye had perception of large moving objects, the pupil reacted, and the eye could be rotated vertically 15 degrees and horizontally 30 degrees. The tumor was nowhere adherent to the bone and was easily removed, with insignificant hemorrhage. The lower lid was removed and the upper, after excision of the lashes, furnished a flap to cover the whole wound.

GLIO-SARCOMA. C. M. Robertson reports a case of glio-sarcoma of the optic nerve in a boy of ten years. The exophthalmos had been noticed for two years, and the eye protruded so that the lids covered the globe only to the equator. The eye was blind and had lost all power

¹ Ophthalmic Record, February, 1898.

² British Medical Journal, August 20, 1898.

³ Ibid., September 3, 1898.

⁴ Transactions American Ophthalmological Society, 1898.

⁵ Loc. cit.

⁶ American Text-book of Diseases of the Eye, Ear, Nose, and Throat, edited by de Schweinitz and Randall.

⁷ Transactions American Ophthalmological Society, 1898.

of movement. The tumor extended to the optic foramen, at the margin of which it was adherent.

ROUND-CELL SARCOMA. G. H. Goode¹ reports a case of round-cell sarcoma of the orbit. The growth was removed without sacrificing the eye, as the latter had full vision. The next month, however, the growth had recurred and the orbit was emptied. A month later it had returned, and was excised with a portion of the lower lid. Two months after this it again recurred, and the patient's general health was beginning to fail.

FIG. 52.



Fibro-sarcoma of the orbit.

D. Webster² reports the case of a man with *orbital sarcoma* who was placed on the table for operation, but, on account of enlarged glands, removal was deferred and large doses of mercury and iodide of potassium were given. He took 120 grains of the latter three times a day and seemed to improve somewhat until he fell into the hands of a quack, who promised cure without operation. Two months later he came back worse, and the growth was removed without removing the eye. There

¹ American Journal of Ophthalmology, December, 1898.

² Medical News, August 27, 1898.

was no return *in situ*, but he died some months later of malignant disease of the throat. A. W. Stirling reports a case of sarcoma with evisceration of the orbit, followed by cauterization of the orbital walls four days later with chloride of zinc paste. There had been no recurrence in any part of the body a year later.

C. S. Bull¹ reports a case of sarcoma removed from the orbit with the entire orbital contents, including the periosteum, which recurred in two months and was again removed; again it recurred, this time involving the neighboring bones and cavities and causing death eight months from the time of the first operation. Alt, in commenting on the case of cancer of the lachrymal gland already referred to (p. 430), states that such cases "should prompt us under similar circumstances to empty the orbit of its whole contents, and thus, perhaps, save the life of the patient, rather than to save the eye and have the patient die as the result of our surgical interference." Bull believes that repeated operations undoubtedly shorten the life of the patient and while it is our duty to operate to relieve severe or unbearable pain, we should hesitate to do so for the sake of temporarily relieving a physical disfigurement. Stirling finds that of ten cases in which the growth alone was removed, without clearing out the contents of the orbit, recurrence took place in nine, and the tenth had been under observation only eighteen months after the removal of the growth. In sixteen cases where all the contents of the orbit were removed, seven had no recurrence after an average of four and one-sixth years, and in only three of these had a less interval than two years elapsed.

Lymphoma of the Orbits and Lids. This is a rare condition which has been mistaken for sarcoma, even after a careful microscopical examination. C. D. Wescott² reports a case of this kind with multiple tumors in both orbits. Operation was refused, but the tumors increasing so that both eyes were closed, the patient insisted on their removal. This was accomplished, and there was no return of the growths before the patient's death, a year and a half later, from pernicious anæmia. Myles Standish has met with two cases, in one of which the removal of the growth was followed by no recurrence in two years. In the other case both orbits were involved, four operations for removal were of no avail, and the growths rapidly increased. The administration of arsenic, beginning with five drops of Fowler's solution three times a day, and increasing the dose one drop every second day until a maximum of ten drops was reached, was then tried. At first the tumors continued to increase but at the end of a month it was noted that they were diminishing and from that time recovery was rapid.

¹ Medical News, September 3, 1898.

² American Journal of Ophthalmology, September, 1898.

Osteoma of the Orbit. A case reported by E. Fridenberg¹ is particularly interesting, because, instead of exophthalmos, it caused enophthalmos, the eye being crowded back into the orbit. The seat of the exostosis, which sprang from the frontal sinus, was quite to the temporal side of the orbit. The eye had appeared smaller than its fellow for fourteen years, and the tumor had been noticed for nine years.

SUBSTITUTES FOR ENUCLEATION OF THE EYEBALL.

Mules' Operation and Modifications of It. In discussing this subject at the recent meeting of the British Medical Association,² Buller advocated Mules' operation in all cases where there was no apparent danger of sympathetic ophthalmia, and Hern thought that when sympathetic irritation had supervened in the uninjured eye, enucleation was the only justifiable proceeding. Spencer Meighan and Prof. Snellen had seen sympathetic ophthalmia follow evisceration, and Little had seen the glass ball ulcerate out three years after insertion. In Fuchs' clinic Mules' operation was very rarely performed (three times in ten months), and for insertion a flattened silver-gilt spheriod, with corners well rounded, was employed. Knapp has used it a few times, but cannot tell how long the satisfactory result first attained lasted, and upon inquiry in Europe he heard more unfavorable than favorable reports. F. Allport is in favor of the Mules' operation, and F. C. Todd³ reports very favorable experiences. L. W. Fox has used it even where there was ciliary injection, keratitis punctata, and dimness of sight in the other eye. F. C. Hotz has had no personal experience with Mules' operation, but thinks it gives no better motility of the artificial eye than evisceration or enucleation. Casey Wood has tried it, but just so far as one produces the desired effect of a prominent artificial eye just so far must he bring pressure upon the structures that hold the sphere in place. He concludes there is very little to recommend the procedure over a properly executed enucleation or evisceration.

Bryant⁴ substitutes for the glass ball of Mules, or the silver globe of Kuhnt, an aluminum globe with five fenestrations, each about half the diameter of the globe. These make it a frame or basket with a rounded front. Experiment on dogs showed that this frame was completely filled with tissue in about ten weeks. He has employed it within the sclera, after evisceration, like the Mules sphere, and implanted it in the orbit after enucleation, and he finds it has all the advantages of the

¹ Transactions American Ophthalmological Society, 1898.

² British Medical Journal, August 20, 1898.

³ New York Medical Journal, September 17, 1898.

⁴ Journal American Medical Association, September 24, 1898.

glass sphere, is lighter, stronger, and less apt to slough out subsequently.

SPONGE GRAFTING. This method of forming an improved stump after enucleation was suggested by E. O. Belt,¹ who made some hopeful experiments. A. G. Thomson had reported a case of accidental sponge grafting in the orbit the year before. Claiborne also tried sponge grafting, but found the substance not suited to the purpose. Trousseau has made similar experiments, and tried the procedure after enucleation. He first enclosed the sponge in the cavity by a purse-string suture, but the disintegrated sponge escaped piecemeal. In one case he acted on Belt's suggestion, to suture the recti tendons in front of the cavity containing the sponge, and attained a satisfactory result. Risley² has also tried it. A part of the sponge was extruded and had to be cut off on the tenth day, but the remainder caused no irritation and became filled with granulation tissue, promising a valuable stump.

Total Combined Keratectomy. Panas, on many eyes that might have been removed, has practised an operation differing somewhat from the old operation of abscission, which he calls total combined keratectomy. He performs it for anterior staphyloma and absolute glaucoma. The first operation was done seventeen years ago, and the stump is but little smaller than at first, and has never given any trouble. He reports³ upon 200 cases. In none has sympathetic disease supervened, and the cosmetic result has been very satisfactory. The operation is done under complete general anæsthesia, to prevent straining. A curved needle is passed behind the iris and lens, making its entrance and exit in the sclero-corneal junction, and is left *in situ*. The cornea is then excised through the sclero-corneal margin, four-fifths of its circumference being divided with a Græfe knife, and the remainder by scissors. The iris, if it has not come away with the cornea, is then dragged out with forceps, and the lens is removed with a cataract scoop. Care is taken to avoid pressure on the eyeball, and to prevent loss of vitreous. The needle already introduced is then drawn through and the suture, bringing the scleral edges together, is tied. Two more similar sutures are introduced and the lateral angles caused by bringing the two sides together are trimmed down with scissors. An iodoform dressing is used, the stitches are removed on the seventh day, and the eye is kept bandaged eight or ten days longer. The stump obtained is usually about three-fourths the size of the normal eyeball.

¹ Medical News, June 27, 1896.

² Transactions American Ophthalmological Society, 1898.

³ Arch. d'Ophthalmologie, September, 1898.

FOREIGN BODIES IN THE EYE AND ORBIT.

Localization by the Roentgen Rays. For the complete localization of a foreign body, one must obtain its shadows on the sensitive plate from two different positions of the source of the rays (the Crookes tube), and must obtain the corresponding two shadows of some known point with which the shadows of the foreign body can be compared. For many purposes the bony prominences of the skull furnish the necessary points of reference, but for localizing foreign bodies in the eye these are not sufficient. One must have something more definite. After the shadows of the known point and the foreign body have been obtained, some method of triangulation must be employed to determine from the two relations of their shadows, the exact relation of the known point to the point sought. Various forms of special apparatus and slight differences in detail of method have been used. They can be understood by the consideration of one method and subsequent reference to points in which others differ from it.

FIG. 53.



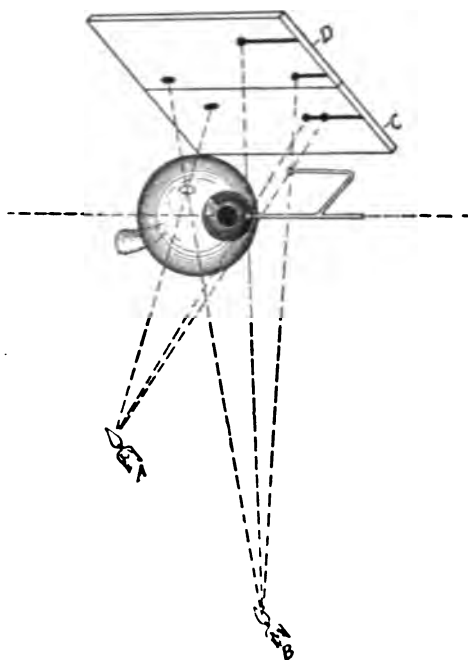
Indicating apparatus and plate holder. (SWEET.)

Sweet¹ uses for the known point a metal ball placed 5 mm. in front of the centre of the cornea in the antero-posterior axis of the globe. A second ball near the outer canthus is useful in showing the horizontal plane passing through the centre of the cornea and of the eyeball.

¹ American Journal of the Medical Sciences, August, 1898; and American Text-book of Diseases of the Eye, Ear, Nose and Throat, edited by de Schweinitz and Randall.

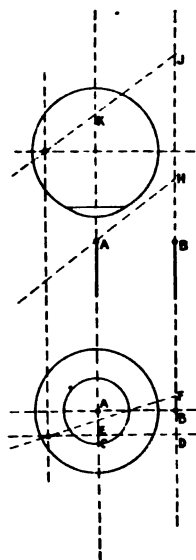
The rods supporting these "indicators" are adjustable, but rigidly connect the latter with the plate-holder which sustains the plate exactly perpendicular to their plane. The whole apparatus is shown adjusted to the patient's head in Fig. 53. The working method is illustrated by Fig. 54. The first exposure is made with the Crookes tube at *A* in the plane of the indicators; the shadows obtained from it are shown on the lower part of the plate, (*C*). The second exposure is made with the tube below the plane of the indicators, as at *B*; the shadows obtained from it are shown on the upper part of the plate *D*. To interpret the nega-

FIG. 54.



Principle of method of localization. (SWEET.)

FIG. 55.



Diagrammatic circles representing the eyeball; upper circle, horizontal section; lower circle, vertical section (reduced one-third in size). (SWEET.)

tives a figure like Fig. 55 is drawn in this way: The upper circle, 24 mm. in diameter, represents the section of the eyeball in the plane of the indicators, and the line from *A* through its centre, the antero-posterior axis; 5 mm. from the part of the circle representing the cornea, mark *A* the first indicator, and at its true distance from *A* mark *B*, the second indicator. Through *B* draw a line parallel to the antero-posterior axis. On this line lay off *BH* equal to the distance between the shadows of the two indicators on the first plate, and *HJ*, the distance the shadow of the foreign body is behind that of the first indicator. (These distances should be slightly diminished if the tube has been near the plate; thus,

if the tube is fifteen inches from the plate, and the second indicator one inch from the plate, the distances laid off should be only 14/15 of the distances on the negative). The line *AH* then represents the direction of one of the X-rays and a line from *J* parallel to this, or rather meeting it at the position of the tube, will represent the course of the X-ray interrupted by the foreign body. Now draw the lower circles, the larger one (24 mm. in diameter) representing the vertical section through the centre of the eyeball, and the smaller circle representing the cornea. *A*, at the centre, represents the first indicator, and *B* the second. Now lay off *BD*, the distance the shadow of the foreign body was below that of the indicators on the first plate, and *BF*, the distance its shadow was above that of the second indicator on the second plate. A horizontal line through *D* will represent the course of the X-ray intercepted by the foreign body in the first exposure. A line through *F* toward the second position of the tube will represent the X-ray intersected by the foreign body in the second exposure, and the intersection of these two lines is the position of the foreign body. To find the direction of the tube in the second position, we measure down from *A* the distance, *AE* (properly diminished), which the shadow of the first indicator is above the shadow of the foreign body on the second plate. When the location of the foreign body is thus determined with reference to the lower circle, measure its distance from *D*, and then at this distance, perpendicular to *HJ* in the upper circle, mark the line *JK*. This gives the position of the foreign body with reference to the upper circle. We can then measure exactly how far it is back from the centre of the cornea, as well as its distance below and to the left of the antero-posterior axis. This method is somewhat elaborate, but it is capable of the most minute exactness and this may be of the greatest importance, as in determining whether a foreign body lies in the lens or has passed through it into the vitreous, where totally different treatment may be appropriate. Without exact localization the chief advantage of the X-rays would be, as Tatham Thompson says, to exclude the presence of foreign bodies in doubtful cases.

Leonard¹ fixes to the shoulders of the patient a yoke carrying a frame which holds the head of the patient in fixed relation to the plate which it supports, and the X-ray tube is carried on an adjustable arm.

The direction of the arm, and so the direction of the tube, in any given exposure, is read off from a graduated arc. The known point is determined by two lead ferrules which slide on an aluminum wire. Mackenzie Davidson² has the patient lie upon the plate, and the tube, being supported upon a horizontal bar above, is moved along it for the

¹ *Annals of Ophthalmology*, April, 1898.

² *British Medical Journal*, January 1, 1898.

second exposure. The fixed point is a bit of lead wire attached by adhesive plaster to the lower lid opposite a known point of the eye. The plate-holder is crossed by two wires at right angles with each other, and the movement of the tube is made parallel to one of these wires. To interpret the negatives obtained, the positions of the two shadows of the foreign body are marked on one plate, or on a card, and placed in the position the plates occupied when the exposures were made. Threads are then stretched from the positions of the tube to these positions of the two shadows, and their intersection gives the position occupied by the foreign body.

A. C. Stoeckel² fastens small pieces of lead, one at the outer margin of the orbit at the level of the external canthus, one at the same level on the bridge of the nose, one each at the middle of the upper and lower margins of the orbit, and one at the outer margin of the orbit of the other eye. He believes the localization can usually be made with sufficient exactness by the fluoroscope without the use of the photographic plate. The plan of localizing points on the orbital margin by bits of lead fastened with adhesive plaster will be found of especial value in case a foreign body is embedded in the orbit outside the eyeball. In the localization of small foreign bodies it becomes of importance to use a tube in which the X-rays proceed from a very small area of the anode. The smaller this area the sharper the shadows. Again, the tube should be run at a high vacuum and the exposure should be short, to lessen the indistinctness due to slight movements.

The Sideroskope. The interference of rival inventions is well illustrated in the history of this instrument. E. Asmus, with much labor, has perfected an instrument for the detection of bits of steel in the eye and elsewhere in the body, which was much desired until the Roentgen rays furnished a method equally applicable for the detection of fragments of metals and other substances, and thus rendered Asmus' instrument largely superfluous. It consists² essentially of a good magnetic needle, delicately poised, which acts on a small mirror; this swings with it, reflecting a scale which is watched in the mirror through a telescope. When the eye containing a particle of steel is brought near one pole of the needle the deviation caused is readily observed and measured. That the instrument is one of positive value is illustrated by the fifty-eight cases cited by Asmus and by the experience of some others. Sachs³ advises its use in all cases. Vuellers⁴ reports a case in which it indicated the position of a particle weighing only 0.4 mg., and perhaps for extremely

¹ Wiener klin. Wochenschrift, February 17, 1898.

² Das Sideroskop und Seine Anwendung.

³ Wiener klin. Wochenschrift, October 27, 1898.

⁴ Deutsche med. Wochenschrift, June 23, 1898.

minute particles it may be found of value where the Roentgen rays are useless. The instrument, however, is one that must be skilfully used with favorable surroundings, and has proved unsatisfactory in some of the large clinics of the great cities because of the jarring of street traffic and other unfavorable influences. It would be, for the mass of cases, an excellent means of diagnosis if we had not a better in the X-rays.

Magnet Extraction. The detection and accurate localization of fragments of steel in the eye by the Roentgen rays has greatly aided in their extraction by the portable electro-magnet. The uncertainty which previously attended these cases is well illustrated by the fact that in one hospital, J. J. Evans¹ tells us, in sixteen cases the magnet was introduced into the eye, but no foreign body was found. The use of the *large fixed magnet of Haab*, when it is available, makes exact localization less important. It is designed to draw out the foreign body through the wound of entrance, or such a wound slightly enlarged, without the point of the magnet being introduced or even coming in contact with the eye. Barkan² reports five cases, in four of which the particle flew out of the eye to the pole of the magnet, distant one-fourth to one inch. In the fifth case a very minute particle was not extracted until the tip of the Haab magnet was brought into the wound, the portable magnet having failed to remove it, even when brought in contact with it. Haab³ says that when the particle has entered through the ciliary body it is better to draw it around the lens into the anterior chamber than to try to extract it through the wound of entrance, for it is difficult for a small chip to find its way through the ciliary body, and if once firmly entangled there it would be hard to extract it. In Fuchs' clinic, according to Bickerton, the Haab magnet has never failed to extract a splinter of iron or steel from the globe, no matter how deeply embedded. It was used there to draw the metal into the anterior chamber whence it was extracted, through a corneal incision, with the small magnet. The Haab magnet is of much value for diagnosis, the turning on of the current when the eye is brought close to it being attended with sharp pain, and the iris sometimes noticeably bulging forward when the iron is behind it.

While the extraction of a piece of metal through the wound of entrance by the Haab magnet is a brilliant application of science, it must be remembered that the future welfare of the eye often demands the removal of the infected tissue with which the foreign body has come in contact. This is much more readily accomplished with the portable magnet, the point of which drags out the tissue around the foreign body with the latter, particularly if the extraction be made through a large

¹ Lancet, August 27, 1898.

² Archives of Ophthalmology, March and May, 1898.

³ Loc. cit.

incision. The proportion of permanent recovery of useful vision in cases of "successful" magnet extraction is still small, showing that the removal of the steel is not the only essential of their successful treatment.

Foreign Bodies Retained in the Cornea. That a foreign body may be tolerated for months and years in the cornea is a fact often lost sight of. Ten cases in which this occurred are reported in the *British Medical Journal*, January 8, 1898. The periods of retention varied from three weeks to eighteen months, and other cases are cited, from the literature on the subject, in which the foreign body remained from two months to ten years. J. T. Thompson, however, reports a yet more notable case. A marker at a rifle range was struck by a "splash" from a bullet. Attempts made in a day or two failed to remove the metal and in a few days all inflammatory symptoms disappeared. After a slight injury twenty-one and a half years later, the eye became red and irritable, and the lower part of the cornea was found to be the seat of an ulcer. After scraping away the soft tissue a shell-shaped fragment of lead, 3 x 2.5 mm., was lifted out and the eye recovered with 6/9 vision. In the sclera the retention of foreign bodies is rather the rule. Benson¹ reports a case in which a piece of iron was encapsulated for fourteen years.

The Spontaneous Extrusion of a Foreign Body from the interior of the eyeball is another very exceptional occurrence. J. P. Worrel² reports a case of this kind. The foreign body, a piece of copper, 1.5 mm. in length, was part of an exploded gun cap. It was seen at the bottom of the anterior chamber, and was spontaneously expelled in two months. Oliver and Posey³ report a case in which the foreign body, a fragment of iron, was said to have entered the eye eight years previously; it remained without disturbance until within about three weeks, when the eyeball had become red and irritable. A dark-brown object was seen in the anterior chamber with its forward extremity, which was surrounded by an area of brownish discoloration, protruding from the cornea. Behind the object was an atrophic area in the iris. A month after it was first seen the removal of the foreign body was completed by seizing it with iris forceps. Vision was never disturbed by it.

¹ British Medical Journal, January 1, 1898.

² Transactions American Ophthalmological Society, 1898.

³ Annals of Ophthalmology, April, 1898.

ANTISEPTICS.

Sterilization of the Conjunctiva. The present tendency regarding antiseptics in ophthalmic surgery is very clearly, as J. A. Bach¹ says, "to discard the stronger and depend more upon obtaining asepsis by means of the weakest solutions, together with mechanical cleansing." This tendency has full justification, both in clinical experience and in bacteriological investigations. There are no statistics which indicate that more powerful germicides give greater immunity from infection following ophthalmic operations, and many observers have found the normal conjunctival sac as nearly sterile as it can be rendered by any methods thus far tried. The latest confirmation of this latter fact comes from Gifford² who, after prolonged search for some method of ridding the conjunctival sac of germs without doing much violence to the tissues, is convinced that from the nature of the conditions present no such method can be found. Even when the conjunctiva was thoroughly wiped out, the patient having been anæsthetized for other purposes, scraping of the conjunctiva at the completion of the cleansing gave active germs in seven out of eight cases. A. McGillivray³ relies on repeated douchings with physiological salt solution. Antiseptic solutions, however weak, irritate or benumb cut tissues and impair their natural immunity, and the weak antiseptic solutions employed in the eye have no germicidal properties unless kept in contact with the micro-organisms for hours, a condition quite impossible in the eye. In regard to antiseptic dressings, Gifford found that bandaging the eye for twenty-four hours certainly increases the number of germs present, and L. Bach found that under antiseptic dressings the increase was often but little less than under a simple moist or dry dressing.

Of course, where the conjunctiva is distinctly pathological and notably infected, as in lachrymal conjunctivitis, a careful, persistent effort to bring it into a normal condition is still regarded as very important, and failure or inability to observe this precaution enormously increases the risks of important operations on the eyeball. Yet even in these cases the "natural immunity" may be sufficient. C. B. Taylor⁴ reports a case in which he did cataract extraction on both eyes "bathed with pus" from lachrymal disease, without having infection of the wound and with good results, an occurrence to be thankful for, perhaps, but not one to be proud of.

¹ Medical News, December, 24, 1898.

² Archives of Ophthalmology, November, 1898.

³ Ophthalmic Review, March, 1898.

⁴ British Medical Journal, January 29, 1898.

Sterilization of Instruments. In Fuchs' clinic¹ all instruments used for purulent and septic cases are kept entirely separate from those used in aseptic eyes. Instruments used in the treatment of trachoma cases are also kept quite apart from the others. Before use the instruments are boiled in a solution of sodium carbonate 1 to 400, the instruments for aseptic cases for one or two minutes, the others longer. Catgut used for sutures is kept in alcoholic solution of mercuric chloride. Silk is boiled twice in carbolic solution, 1 to 40, and kept in such a solution. Needles are boiled, then threaded, and the needle and silk dipped again for half a minute in boiling water. Towels and dressings are kept in the hot-air sterilizer for an hour or two.

FORMALDEHYDE SOLUTION. Lippincott,² who believes that a temperature approaching the boiling-point, continued for any length of time, impairs the cutting qualities of edged tools, made extensive experiments as to their sterilization and has adopted the plan of keeping them continuously in an 8 per cent. solution of formaldehyde, to which has been added 2 or 3 per cent. of borax to prevent any corrosive action of the solution upon the metal. Experiment showed that a twenty-four hours' exposure to this solution rendered everything sterile, even when liberally smeared with infectious materials. A much weaker solution failed to show constant complete sterilization, but with instruments fairly cleansed previously it would probably have been effective. When required for use, Lippincott rinses the instruments in a solution of borax and wipes each one with a bit of cotton previously boiled in borax solution to remove a film that may adhere to the blade.

STERILIZATION BY FORMALDEHYDE GAS has been the subject of experiment by H. O. Reik.³ He develops the gas from the pastilles of paraform, and finds that in a box or sterilizer of one cubic foot capacity, instruments smeared with pure cultures of the pus organisms and anthrax bacillus are sterilized by ten-minutes' exposure to the gas generated from 5 grains of paraform. A fifteen-minutes' exposure never failed with any organism. The process does not injure in any way the instruments employed in ophthalmic surgery, and its quickness, cheapness and simplicity strongly recommend it.

LOCAL ANÆSTHETICS.

Holocaine is the first local anæsthetic to fairly rival cocaine in practical usefulness in ophthalmic surgery, and it seems likely to supplant it for certain classes of operations. Eucaine and some other drugs put

¹ Medical News, October 15, 1898.

² Archives of Ophthalmology, July, 1898.

³ Philadelphia Medical Journal, February 4, 1899.

forward as local anæsthetics are much too irritating to the conjunctiva to be of practical value here. Holocaine is used in the form of a 1 per cent. solution of the hydrochlorate, an almost saturated solution in cold water. The solution is apt to be rendered cloudy from precipitation by the smallest amount of alkali, even that which is dissolved out of some glass. It is very decidedly antiseptic; Randolph found that it destroyed pus organisms within twenty-four hours. Hinshelwood¹ finds that it causes a slight burning on instillation, but causes complete anæsthesia of the cornea and conjunctiva in fifteen or thirty seconds, which lasts for five or ten minutes. It produces no effect on the pupil, intra-ocular tension and vascularity of the eye, nor does it cause disturbance of the corneal surface, differing in all these points from cocaine. All observers agree that anæsthesia is more quickly produced by holocaine; Hinshelwood thinks it lasts longer, but Hotz thinks only half as long as cocaine anæsthesia. Würdemann and Black² find that anæsthesia from a single drop lasts ten minutes, and from three drops instilled at intervals of a minute it lasts twenty minutes. Additional instillations continue the anæsthetic effect. Several observers have thought holocaine has more anæsthetic influence on the inflamed and hyperæmic eye than has cocaine, but Hinshelwood carefully tested this by dropping a 1 per cent. solution of holocaine in one eye, and a 2 per cent. solution of cocaine in the other, when both were to be subjected to applications of silver nitrate or copper sulphate, and found the one as efficient in producing anæsthesia as the other. Experimentally, holocaine has been found to be more actively poisonous than cocaine, and, therefore, has not been used hypodermatically in man. In its bactericidal action it has a distinct advantage over cocaine, as it has in it more rapid action for small operations such as the extraction of foreign bodies. Its failure to contract the bloodvessels or dilate the pupil will also be advantageous for some operations, but for others this action places it at a disadvantage. The power of cocaine to control hemorrhage is a decided advantage in some operations, as for pterygium, or in operations on the eye muscles.

Cocaine Hydrochlorate in Crystalline Form. The production of local anæsthesia in the eye by this method of application, instead of solution, has been tried by A. Bronner³ who pronounces it more efficient than the usual method, especially for most operations on the conjunctiva and for iridectomy in glaucoma, and for cataract extraction without iridectomy. From one-fourth to one grain of the crystalline salt is laid upon the part in which the incision is to be made, the eyelids are kept open

¹ Ophthalmic Review, July, 1898

² Ophthalmic Record, January, 1898.

³ Ophthalmic Review, July, 1898.

for a few seconds and then closed for four or five minutes. A preliminary instillation of a cocaine solution is to be used, as without it the crystals cause rather severe burning pain. In operations upon the ocular muscles an incision is made through the conjunctiva and subconjunctival tissue, and the cocaine placed in it.

THE INDISCRIMINATE USE OF COCAINE is the subject of a warning from Theobald,¹ who has known of its being prescribed for inflammation of the eye. As he says, "There seems to be no indication for its employment under such circumstances, and it is capable of doing more harm than good."

SPECIAL THERAPEUTIC MEASURES.

Suprarenal Extract. The use in the eye of watery solution of the aqueous extract of the suprarenal gland of the sheep was first suggested by Bates,² who now reports his fuller experience with it. It is used in a solution prepared by mixing from 2 to 20 per cent. of the extract with water, allowing it to stand a few minutes and then filtering. The solution may be boiled repeatedly to keep it sterile, though prolonged boiling weakens it; it is readily infected from the air and spoils quickly. This solution dropped into the conjunctival sac quickly blanches it, diminishing the number and size of visible vessels. It is not irritating, causes rather a cooling sensation, and does not affect the pupil nor accommodation. Its astringent effect lasts for about an hour, and is not succeeded by any period of hyperæmia. Its application many times a day, for months, did not lessen its effect or produce effects other than those mentioned. It is not compatible with other drugs in the same solution. When mixed with cocaine the eye is irritated and not anæsthetized, although its use prior to the instillation of cocaine increases the anæsthetic effect, especially when the tissue is hyperæmic. On this account it is of especial value for operations on inflamed eyes, as for example, the excision of a prolapsed iris following cataract extraction, iridectomy for glaucoma, the Sameisch operation, etc. It also greatly diminishes hemorrhage. In interstitial keratitis it causes the vessels upon the cornea to promptly disappear, and in other ocular inflammations it has seemed beneficial through the temporary emptying of the vessels. In lachrymal obstruction it so reduced the swelling as to render the duct patulous in some cases; it facilitated the introduction of probes, and diminished bleeding. Bates' observations have been confirmed by many observers, notably in the past year by Reeve, Kyle and Mullen. The stronger solutions are capable in some persons of causing distinct local discomfort or pain.

¹ Johns Hopkins Hospital Bulletin, August, 1898.

² New York Medical Journal, May 16, 1898.

Pilocarpine. The necessity for a fixed routine for procedure in the hypodermic use of pilocarpine is urged by Burnham.¹ He gives from one-twelfth to one-fourth of a grain at each injection, using a strong solution, 1 to 12, and dipping the hypodermic needle in a carbolic solution just before using, to lessen the local irritation. The patient is put to bed with an empty stomach, is well wrapped in flannel in a room at 75° F., and the injection given unaccompanied by any stimulant. The patient remains in bed two or three hours until the reaction to the drug is over, gets up, is wiped with warm towels, dresses, eats his evening meal, and goes about the house. The next day he can go to business. This is repeated daily usually until from six to twenty injections have been given. Then an interval of three to eight weeks is allowed and another group of six to ten injections given, and these groups are repeated as long as they seem beneficial.

REFRACTION AND ACCOMMODATION.

The Operative Treatment of High Myopia. During the past year this has been much more frequently resorted to outside of Germany, while the reports from that country have been less glowing than previously. It is evident that outside of Germany the cases deemed proper for operation are quite rare. In the discussion at the American Ophthalmological Society,² Bull reported that among 347 cases of myopia of over 12 D. he had met with but three in which the operation seemed advisable. One of these was operated on, and the result was unsatisfactory. Roosa was impressed with the belief that more exact information regarding methods and results is needed.

The enormous change in the refraction produced by removal of the lens in high myopia has been a matter of surprise to operators. Thus Mittendorf has encountered changes of 19 D. and 22 D., Sattler reported a change of 21 D., and Wilmer 23 D. The reason for the great changes is discussed in the *Ophthalmic Record*, February, 1898. The fact is that as the antero-posterior axis of the eyeball lengthens the effect of the crystalline lens on the refraction of the eye is increased, so that for the accepted average curvatures of cornea and lens, while the removal of the crystalline from an emmetropic eye causes a hyperopia corrected by a 10.5 D. convex lens, its removal from an eye requiring an 18 D. concave lens to correct its myopia, may be expected to render the eye about emmetropic. In general, the higher the myopia, the greater the optical effect to be expected from removal of the lens. An eye requiring a concave 35 D. lens before removal would, after the removal, require only a concave 4 or 5 D. lens.

¹ Archives of Ophthalmology, March, 1898.

² Transactions, 1898.

THE RESULT OF THE OPERATION. There can be no question that in cases which do well the benefit is very great. The increase in visual acuteness in a case pursuing the normal course should be 50 to 70 per cent. from the alteration of the optical conditions alone.

HOW OFTEN WILL THE BENEFIT BE PERMANENT? Data to answer this question are accumulating. The case operated on by Casey Wood in 1891, the first in this country, had vision improved to 20/50, and has gone on improving, seven years afterward having no trouble with her eye whatever. Scheffels¹ reports the results in ten cases under observation from two to four years after the removal of the crystalline was complete. In two cases no change in the refraction had occurred three and one-half years after the healing was complete. In the other eight there had been changes of 0.5 to 2 D., indicating that distention of the eyeball was still going on. In two of these cases in which one eye had been operated on, the myopia in the unoperated eye was still progressive, the changes being greater, *when measured in dioptries* (3 D. to 2 D. and 2 D. to 1 D.) in this eye. But making allowance for the difference in the optical conditions it is seen that this change means practically the same increase in the antero-posterior axis of the eyeball in the operated as in the unoperated eyes. That the operation is followed not very rarely by detachment of the retina is now certain. Of course detachment of the retina is likely to occur in highly myopic eyes without operation, but Schreiber believes the liability is increased by operations, and Wray, in 123 eyes having over 10 D. of myopia, encountered but three with retinal detachment, and these in patients over forty-five years of age. Frost² thinks that vitreous opacities may be increased by the operation, and would restrict it to one eye until several years' experience has rendered possible a better judgment as to ultimate results.

THE BEST METHOD OF OPERATING on adults is still an open question. In young children small discissions and gradual absorption are probably safest. To older patients and to the operators Fukala's plan of free division of the lens and extraction a few days later when it has swollen and the eye has become hyperæmic, has too often brought disappointment. It is certainly safer to begin with a small opening in the anterior capsule, and to extract the bulk of the lens as soon as the first symptoms of hyperæmia appear, even though the lens be not entirely opaque. At the Heidelberg Congress for 1898 Sattler brought forward, as a simplified procedure, the extraction of the greater part of the clear lens without previous discission. He accomplishes this through a curved lance incision 6 to 8 mm. in length, getting away about two-thirds of the lens with a curette, and considerably later he does a final discission. Hess

¹ Klin. Monatsbl. f. Augenheilk., 1898.

² Edinburgh Medical Journal, October, 1898.

has done a similar operation, and Hirschberg also omits the preliminary dissection.

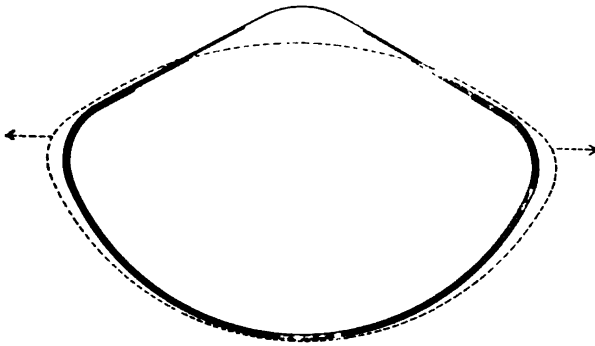
The Non-operative Treatment of Myopia will always be of far wider importance than the operative, and it is to be hoped that certain errors as to the danger of its optical correction are passing away. The observations of Hess and Heine, that accommodation does not increase the intra-ocular tension, should have some influence in awakening ophthalmologists to the clinical fact which has long been presented to them, that *normal use of the accommodation does not increase the tendency of myopia to progress* when such use of the accommodation is dissociated from the abnormal convergence which does increase it. Hubbell¹ makes a strong argument for the more general and complete correction of this error of refraction.

The Mechanism of Accommodation. This is still unsettled. Thomas Young suggested that contraction of the ciliary muscle increased the tension of the capsule and directly increased the convexity of the lens, drawing it forward. Helmholtz found that the posterior surface of the lens did not move forward, and said that the contraction of the ciliary muscle took an elastic tension off the suspensory capsule and relieved the lens from a compression which kept it flattened, and thus permitted it to become more globular. This explanation agreed so well with the anatomy of the parts that it was widely, but not quite universally, accepted. Later, Tscherning showed, by careful measurements with the ophthalmometer, that the lens did not become more globular during accommodation, but that the anterior surface became more curved at the centre and flattened toward the periphery, and he fell back on Young's explanation of increased tension of the suspensory capsule. Then Hess and Heine, confirmed by others, demonstrated that during strong accommodation the lens became more movable and sank toward the side of the eye which happened to be placed lower, as much as a half millimetre, and during the spasm of accommodation produced by eserine as much as a whole millimetre, showing clearly a relaxation of the suspensory zonula. At this point Priestly Smith has taken up the problem and has demonstrated that relaxation of the zonula may produce various changes in the shape of the lens dependent on the relative resistance of the lens itself in different directions, and that supposing the resistance to increase from the anterior pole of the lens toward the equator, relaxation of the zonula, as supposed by Helmholtz, produces the change of form observed by Tscherning. The model illustrating these changes is represented in Fig. 56. The outer solid line represents the outline when traction is taken off during accommodation, and the inner solid lines the reinforcement of resistance away from the anterior

¹ Ophthalmic Record, December, 1898.

pole of the lens. The dotted line represents the shape assumed under traction on the zonula. It is suggested that the peculiar arrangement of lens fibres may furnish the resistance here assumed.

FIG. 56.



Lens changes during accommodation.

ACCOMMODATION IN THE EYES OF LOWER ANIMALS. This phenomenon has been studied to throw light on that of man. Barrett,¹ using the shadow-test to observe the eyes of living mammals, was unable to demonstrate accommodation except in the eyes of monkeys, but Beer² was able to demonstrate accommodation in the eyes of most mammals, though it often was not more than 2 or 3 D. In the rabbit and other rodents, however, he was not able to detect any evidence of accommodation. Priestley Smith,³ by electrical stimulation of the excised eye of the rabbit, was able to produce accommodation of 4 D., and he has also noticed, by the shadow-test, an obvious accommodative change in the eyes of living rabbits.

THE EXTRA-OCULAR MUSCLES.

Treatment of Convergent Squint. The treatment of squint, apart from operative methods, and the correction of errors of refraction by various exercises of the supposed weakened muscles, has been much written about and little practised. Something in this line has been done by the use of prisms, but all other methods have been so complex or so inconvenient as to never come into general use. Priestley Smith⁴ groups such measures under the general heading of "Educative Treatment." Three simple methods are the following: The covering of

¹ Ophthalmic Review, September, 1898.

² Wiener klin. Wochenschrift, October 20, 1898.

³ Ophthalmic Review, October, 1898.

⁴ Bowman Lecture for 1898.

the fixing eye is chiefly of value to compel practice with the deviating eye if it has false fixation. By this method true fixation with the macula may in some cases be regained, and the acuteness of vision may also be improved.

When the patient has true fixation with each eye alone, although the two will not fix truly at the same time, "bar-reading" is useful. The object is to hold a ruler or bar in such a way that in reading neither eye can see the whole of a line, but each eye can see the part that is hidden from the other. In this way the patient is compelled to use both eyes to read every line, and if the treatment is successful he learns at length, instead of shifting the fixation every time he comes to the bar, to keep both eyes correctly fixed all the time. The bar recommended is simply a thin strip of metal bent at two points to a right angle, one end of which is held to the page with the thumb, the other portion rising up and extending above the page across the lines to be read. The "reading-bar" can be used by anyone who reads without any especial inconvenience, and as much of the time as may be thought wise.

The "fusion tubes" consist of two short tubes loosely connected with chains, so that their direction with reference to one another can be readily varied. In the end to be applied to the eye is a convex lens with a focal distance equal to the length of the tube, and at the other end is an opaque diaphragm with two small openings, one in the centre which is clear, and one to the temporal side of the tube over which is a film of gelatine, red for one eye and green for the other. When these tubes are held before the eye four holes may be seen, two white, one red, and one green. On turning the tubes in the direction of the lines of fixation for the two eyes, the two white openings fuse together and appear as one, with a red hole on one side and a green one on the other. The power of fusion is cultivated by slightly changing the directions of the tubes with reference to each other, and, by an increasing effort, keeping the white opening single as long as possible, or, again, by the practice of bringing the two holes together again when they have been separated. This exercise should not be long continued at one time, but can be practised by children too young to read. These extremely simple methods are available in all cases of squint, either as a primary treatment or after operation, and for use by the patient at home.

Where expense does not debar its use, practice with the stereoscope is of value. The ordinary stereoscope is very imperfectly suited to the purpose of such exercises, although it can sometimes be made to answer.

A modification especially suited to this use has been devised by Derby.¹ The "travellers" that carry the separated half-pictures are

¹ New York Eye and Ear Infirmary Reports, 1898.

adjustable in any direction, moving before a graduated background, from which their position can be read and recorded. Oliver¹ has devised a modified form of stereoscope in which the eye-pieces are fully adjustable.

The Complexity of the Movements of the Eyes is well brought out by some elaborate calculations of Weiland.² He shows that even the simple abduction of one eye is the resultant of the various actions of four or more muscles, and as one of these factors is changed by the inaction or overaction of some one muscle, the relations of the other factors must necessarily be completely altered. Viewed in the light of these facts the readjustment of muscular balances, after the influence of a muscle has been diminished or increased by tenotomy or advancement, presents problems of which the confirmed muscle-snippers have shown very slight appreciation. Even the gross action of the accessory adductors and abductors in high degrees of squint is generally ignored. It is well emphasized by Fisher.³ Thus when the eye is turned toward the nose the superior and inferior recti assist the internus to turn it in, and when it is abnormally convergent their power to turn it still further in, or to resist any effort to turn it out, is correspondingly increased. In the same way when the eye is turned out the superior and inferior oblique muscles aid in turning it out, or resist any effort to lessen its divergence. These complex relations have to some extent long been recognized, and yet convergent and divergent squint are still talked about, written about and treated as though they were simply disorders of the internal and external recti.

This tendency is particularly noticeable in what has been written during the past year, on *anomalies of rotation* of the eyeballs which are usually mentioned as anomalies of the oblique muscles. These are at present attracting attention, but nothing of a practical character has yet developed regarding them except, perhaps, methods for their detection and study. The best of these methods for practical use are based on the Maddox rod-test.

¹ Ophthalmic Record, January, 1898.

² Arch. of Ophthalmol., January, 1898.

³ Royal London Ophthalmic Hospital Reports, vol. xiv., Part III.

INDEX.

- ABDOMEN**, condition of the blood in
 septic diseases of the pelvis and, 271
 laparotomy for gunshot wounds of the,
 133
 surgery of, 17
Abdominal cavity, foreign bodies accident-
 ally left in, 237
 surgery of, 17
 hysteromyomectomy. *See* Hystero-
 myomectomy, abdominal.
 hysterectomy, 239
 hysteromyotomy. *See* Hystero-my-
 otomy, abdominal.
 incisions, 22
 operations, line of incision in, 170
 production of hernia in, 171
 surgery, the use of drainage in, 17
 of rubber gloves in, 21
 wall, condition of, as predisposing to
 post-operative hernia, 175
 emphysema of, after laparotomy,
 225
 wound, methods of closing and their
 relationship to post-operative hernia,
 169
Abscess of the liver, 65
Absorption of iron in relation to its use in
 anemia, 272
Accommodation, influence of, upon intra-
 ocular tension, 424
 mechanism of, 453
 refraction and, 451
Acetone, origin of, 327
 relationship of diet to elimination of,
 327
Acetonuria, 326
Acute contagious conjunctivitis, 371
 diabetes, 321
 leukæmia, 293
Addison's disease, 306
 etiology of, 306
 relationship of malignant disease
 to, 307
 symptoms of, 308
 treatment of, 308
Addisonian pernicious anæmia, 282
Adenoma of the ciliary body, 391
Albuminuric retinitis, 396
 prognosis of, 397
Alexander operation, comparison of, with
 suspensio uteri, 220
Alimentary glycosuria e saccharo, 312
Alkalinity of the blood, 249
 significance of, 265
Amaurosis, quinine, 405
Amaurotic family idiocy, eye lesions in,
 399
Amblyopia from various causes, 408
 tobacco, 407
Amblyopias, toxic, 405
Ammonia in the blood, 264
Ammonisemia, 264
Anæmia, neuro-retinitis of, 397
 pernicious 279
 Addisonian, 282
 nervous lesions in, 283
 relation of parasitism to, 282
 treatment of, 284
 secondary, 270
 splenic, 288
 treatment of, 272
 absorption of iron in, 172
 injections of hæmoglobin in, 275
 respiratory gymnastics in, 275
Anæsthetics, local, in ophthalmology, 448
Anastomosis, the value of mechanical aids
 in intestinal, 69
 intestinal, Laplace's forceps for, 74
Angioma of the lachrymal gland, 420
 cavernous, of the orbit, 436
Angiotripsy, 240
Anomalies of rotation of the eyeballs, 456
Anticoagulant bodies in the blood, 260
Antisepsis in ophthalmology, 447
Aphasia in diabetes, 329
Apparatus, the lachrymal, 430
Appendicitis, 114
 Deaver's plan of treatment in, 120
 French views on treatment of, 121
 hernia following, 109
 Kummel's investigations in, 128
 pathology and therapy of, 129
 treatment of, 114
 Richardson's and Brewster's views
 on, 115
 of the stump in operation for, 119,
 121
Appendix vermiformis, hernia of, 87
 cæcum and, 86
 pathology and therapy of inflammation
 of, 129
Argentamine in the treatment of conjuncti-
 vitis, 375
Argonin in the treatment of conjunctivitis,
 375
Arterial disease, general, ophthalmoscopic
 evidence of, 402
Artery, central retinal, thrombosis of, 401
 internal carotid, blindness from ligation
 of, 401

- Arthritis, rheumatoid, 351
 scleroderma associated with, 353
 Artificial leucocytosis, value of, 267
 Auto-intoxication, amblyopia from, 408
- BACILLUS**, gas, in emphysema of abdominal wall after laparotomy, 226
 Bacteriology of diseases of the conjunctiva, 367
 Ball, method of, for operation in hernia, 87
 Bandage, abdominal, influence of, on post-operative hernia, 177
 Barlow's disease, 301
 "Bar-reading" for convergent squint, 455
 Baumm, views of, on operative treatment of retroflexion of the uterus, 202
 Bile-ducts, gall-bladder and, 50
 surgery of, 52
 Biliary colic, 55
 Blindness from ligation of the internal carotid artery, 401
 word-, 411
 Blood, 249
 alkalinity of, 249
 significance of, 265
 altered conditions of the plasma or serum of, 266
 anticoagulant bodies of, 260
 ammonia in, 264
 changes in, in leucocytosis, 268
 cholesterin in, 263
 composition of, influence of various physical conditions upon, 255
 various elements of, 258
 condition of, in chlorosis, 276
 in septic diseases of the abdomen and pelvis, 271
 diseases of, 249
 estimation of iron and hæmoglobin in, 250
 in diabetes, 324
 leucocytosis, 266
 lipolytic function of, 262
 quantity of fibrin in, 259
 specific gravity of, 252
 staining, 249
 -films, fixing, 253
 Bloodgood, method of, for the cure of hernia, 96
 Bodies, foreign, accidentally left in the abdominal cavity, 237
 in the eye and orbit, 441
 localization of, 441
 retained in the cornea, 446
 Body, the ciliary, 391
 Brain tumor, optic neuritis in connection with, 397
 Bullous keratitis, 384
 treatment of, 384
 Buphthalmos, 424
 Button, Frank's, 34
 Murphy's, 34, 69
- CACHEXIA**, pigmentary, consecutive to purpura, 299
 Cæcum and appendix, hernia of, 86
 Calculi, biliary, removal of, from the common duct, by the duodenal route, 62
 Canal, the hyaloid, 420
 Cancer. *See* Carcinoma.
 Carcinoma, metastatic, of the choroid, 393
 of the caruncle, 380
 of the epithelial type, 166
 clinical aspect of, 167
 of the glandular type, 166
 clinical aspect of, 167
 of the pancreas, glycosuria and, 322
 of the uterus, radical operations for, 234
 primary, of the conjunctiva, 380
 resection of the intestine for, 136
 schirrus, of the lachrymal gland, 430
 Caruncle, carcinoma of the, 380
 Cassarpe in the treatment of corneal ulcers, 383
 Castration, influence of, upon female constitution, 141
 general constitution, 149
 menstruation, 142
 sexual function, 145
 organs, 149
 nervous and psychical systems, 150
 therapeutic effect of, 151
 Cataract, 411
 anterior polar, 412
 congenital, 412
 diabetic, 413
 due to eye strain, 413
 extraction, results of, 419
 frequency of, among glass-blowers, 412
 open-wound treatment of, 418
 operations, 414
 secondary operations for, 419
 senile, 413
 spontaneous recovery from, 413
 tetany and the causation of, 412
 traumatic, 411
 Cavity, abdominal, foreign bodies accidentally left in, 237
 surgery of, 17
 Centres, optic nerve tracts and, 409
 Chalazion, 429
 Champonnière, method of, for the cure of hernia, 93
 Chancre of the eyelids, 426
 Changes in the blood in leucocytosis, 268
 pupillary, 389
 Children, exophthalmic goitre in, strontium bromide and iodide in the treatment of, 365
 leukæmia in, 285
 results of hernia operations in, 103.
 See also Infants.
 Chlorosis, 275
 condition of the blood in, 276
 symptoms, gastro-intestinal, 278
 thrombosis in, 277
 treatment of, 279
 Cholecystotomy, 51
 Poppert's modified, 52
 two-stage operation in, 56
 Cholesterin in the blood, 263

- Choroid, 391
tumors of, 392
- Choroiditis, 391
- Chorio-retinitis, 391
- Cicatrix after abdominal operations; exam-
ination of, 172
post-operative influence of pregnancy
on, 177
stability of, after repeated laparotomies,
179
- Ciliary body, 391
tumors of, 391
- Circinata retinitis, 398
- Classification, origin and, of leucocytes,
254
- Coagulation, hypoleucocytosis caused by
substances preventing, 268
- Cocaine hydrochlorate in crystalline form
in ophthalmic surgery, 449
poisoning, exophthalmos a sign of,
435
- Colic, biliary, 55
- Colon, surgery of, 49
- Coma, diabetic, treatment of, 334
- Common duct, removal of calculi from, by
the duodenal route, 62
suture of, advisability of, 53
- Composition of the blood, influence of va-
rious physical conditions upon, 255
of the various elements of the blood,
258
- Condition of the blood in chlorosis, 276
- Conditions, altered, of the plasma or serum
of the blood, 266
- Congenital cataract, 412
glaucoma, 424
leukæmia, 287
- Conjunctiva, diphtheria of, 369
diseases of, 367
bacteriology of, 367
sterilization of, 447
tumors of, 379, 380
- Conjunctivitis, acute contagious, 371
diplobacillus, 371
gonorrhæal, 368
Parinaud's, 374
pneumococcus, 372
treatment of, 372, 374
- Conservative operations upon the ovaries
and tubes, 247
- Constituents, proteid, of hæmoglobin, 265
- Constitution, general, influence of castra-
tion upon, 149
influence of, upon post-operative cica-
tricial formation, 175
- Contagious conjunctivitis, acute, 371
- Convergent squint, treatment of, 454
- Cornea, diseases of, 381
foreign bodies retained in, 446
suture of, 388
- Corneal opacities, 385
ulcers, general treatment of, 383
ulcer, 381
Sæmisch section for, 382
fluorescein in, 381
toluidin-blue in, 381
- Corpuscles, red, volume and form of, 253
- Corpuscles, white, origin and classification
of, 254
- Crystalline lens, 411
- Cylinder, inflated rubber, for suture of in-
testine, 71
- Cyst, dermoid, of the orbit, 435
of the hyaloid canal, 420
- Cysts, dermoid, of the ovary, histogenesis
of, 159
echinococcus, of the liver, 68
of the conjunctiva, 379
- D**EAVER, modified operation of, for the
cure of hernia, 94
plan of treatment of, in appendicitis,
120
- Definition of diabetes mellitus, 312
of glycosuria, 336
- Delayed union after cataract operation,
417
- Dermatitis from mydriatics, 427
- Dermoid cyst of the orbit, 435
cysts of the ovary, histogenesis of,
159
- Detachment of the retina, 403
treatment of, 404
- Diathetic diseases, 249
- Diabetes, absence of knee-jerk in, 328
acute, 321
aphasia in, 329
decipiens, 324
relation of digestion to, 328
the blood in, 324
tests for urine in, 326
treatment of, 329
coma in, 334
insipidus, 343
pregnancy in, 347
mellitus, 312
definition of, 312
etiology of, 314
diagnosis of, 323
pancreatic disease and, 322
symptoms of, 324
the relationship of gout, obesity
and, 315
of hepatic disease and, 318
of nervous diseases and inju-
ries to the nervous system
with, 316
of renal disease and, 319
of syphilis with, 317
- Diabetic, cataract, 413
coma, treatment of, 334
xanthoma, 320
- Diagnosis of diabetes, 323
of exophthalmic goitre, 362
- Digestion, relation of, to diabetes, 328
- Diphtheria of the conjunctiva, 369
- Diplobacillus conjunctivitis, 371
- Disease, Addison's, 306
etiology of, 306
the relationship of malignant dis-
ease to, 307
- Barlow's, 301
- digestive leucocytosis in, 268

- Disease, general arterial, ophthalmoscopic**
 evidence of, 402
 hepatic and, the relationship of, diabetes, 318
 Hodgkin's, 297
 inflammatory, ultimate results in vaginal hysterectomy for, 241
 malignant, of the rectum, surgery of, 137
 the relationship of, to Addison's disease, 307
 of the stomach, 36
 of the liver and gall-bladder, 65
 ocular, visual hallucinations in, 411
 pancreatic, diabetes and, 322
 renal, the relationship of, and diabetes, 319
 retinal vascular, 401
- Diseases, diathetic and metabolic, 249**
 nervous, the relationship of, with diabetes, 316
 of the blood, 249
 of the conjunctiva, 367
 bacteriology of, 367
 of the cornea, 381
 of the lachrymal passages, 431
 treatment of, 431, 432, 433
 of the lymphatic system, 249
 of the spleen, 249
 of the retina and head of the optic nerve, 396
 of the thyroid gland, 249
 septic, of abdomen and pelvis, condition of the blood in, 271
- Disorders, of metabolism, 306**
- Dissecans, perivaginitis phlegmonosa, 227**
- Drainage, the use of, in abdominal surgery, 17**
- Duct, common, Halstead's miniature hammers for suture of, 52**
- Ducts, bile. See Bile ducts.**
- Dührssen, radical views of, on retroflexion of the uterus, 201**
- Duodenum, perforating ulcer of the, 46**
 surgery of, 46
- Dyes, aniline, amblyopia from, 408**
- EAR, internal, hemorrhages into, in leukæmia, 287**
- Echinococcus cysts of the liver, 68**
- Ectopic pregnancy, tubo-ovarian hemorrhage resembling, 229**
- Ectropion, of the lower eyelid, 428**
- Eczema, of the eyelids, 426**
- Edebohls, method of, of shortening the round ligaments, 207**
- Effects of splenectomy, 305**
- Elements, blood-, composition of the various, 258**
- Emphysema of the abdominal wall after laparotomy, 225**
- Endometritis hyperplastica ovarialis, 231**
- Enterorrhaphy, Harris' method of circular, 80**
- Enterostomy, the treatment of intestinal paralysis and peritonitis by, 24**
- Entropion, 428**
- Enucleation of the eye, substitutes for, 439**
- Eosinophilia, significance of, 269**
- Epigastric hernia. See Hernia, epigastric.**
- Etiology of Addison's disease, 306**
 of diabetes mellitus, 314
 of exophthalmic goitre, 359
 of glycosuria, 336
 of gout, 347
 of leukæmia, 284
 of myxœdema, 353
- Exophthalmic goitre. See Goitre, exophthalmic.**
- Exophthalmos, 434**
 a symptom of cocaine poisoning, 435
- Extirpation of the lachrymal sac, 432**
- Extract, mammary, myoma uteri treated by thyroid and, 248**
 of suprarenal gland in the treatment of Addison's disease, 309, 311
 of thymus, the use of in exophthalmic goitre, 364
 ovarian, 155
 suprarenal, in ophthalmology, 450
 thyroid, myoma uteri treated by mammary extract and, 248
 the use of, in exophthalmic goitre, 364
- Extraction, cataract, results of, 419**
 magnet, of foreign bodies in the eye, 445
- Extra ocular muscles, 454**
- Eye, enucleation of the, substitutes for, 439**
 sponge-grafting after, 440
 foreign bodies in the, localization of, 441
 -lesions, in amaurotic family idiocy, 399
 powder stains of, 430
 -strain, cataract due to, 413
 -symptoms, exophthalmic goitre with unilateral, 434
- Eyeball, substitutes for enucleation of, 439**
- Eyeballs, anomalies of rotation of, 456**
- Eyelids, 425**
 chancre of, 426
 ectropion, 428
 entropion, 428
 gumma of, 426
 herpes and eczema of, 426
 idiopathic gangrene of the skin of the brow and, 426
 lymphoma of the orbit and, 438
 operations upon, 427
- Eyes, complexity of the movements of, 456**
- FEMALE constitution, the influence of castration upon, 141**
 inguinal hernia in the, 106
- Femoral hernia. See Hernia, femoral.**
- Fibrin, quantity in the blood, 259**
- Films, fixing blood-, 253**
- Fixing blood-films, 253**
- Fluorescin, use of, in corneal ulcer, 381**
- Forceps, Laplace's, for intestinal anastomosis, 74**

- Foreign body, spontaneous extrusion of, from the eye, 446
 bodies accidentally left in the abdominal cavity, 237
 in the eye and orbit, 441
 localization of, 441
 retained in the cornea, 446
 Formaldehyde gas, sterilization of instruments by, 448
 Formol in the treatment of corneal ulcers, 383
 Fowler, method of, for the cure of inguinal hernia, 91
 Frank's button, 34
 Frölich, methylene-blue method of, for examining urine for sugar, 342
 Function, sexual, the influence of castration upon, 145
 lipolytic, of blood, 262
 "Fusion tubes" for convergent squint, 455

- G**ALL-BLADDER, disease of the liver and, 65
 retention of, in operation, 55
 surgery of the bile ducts and, 50
 Gallstones, shape and character of, 56
 Gangrene, idiopathic, of the skin of the eyelids and brow, 426
 Gas bacillus in emphysema of the abdominal wall after laparotomy, 226
 Gastrectomy, 25
 indications for, 25
 Gastric ulcer, surgical treatment of, 44
 Gastro-enterostomy "en Y," Roux's, 41
 indications for, 28
 mortality of, 28
 Gland, lachrymal, syphilitic enlargement of, 431
 tumors of, 430
 thyroid, diseases of, 249
 Glase-blowers, frequency of cataract among, 412
 Glaucoma, 421
 congenital, 424
 Hancock's operation for, 422
 massage for, 423
 mydriatics in, 423
 resection of the cervical sympathetic, for, 421
 tension of the general arterial system in, 424
 treatment of, 421
 Gliosarcoma of the orbit, 436
 Glycosuria, 336
 cancer of the pancreas and, 322
 definition of, 336
 etiology of, 336
 methods of examining the urine in, 342
 the liver and, 340
 Goitre, exophthalmic, diagnosis of, 362
 etiology of, 359
 from the ophthalmic stand-point, 434
 operations on sympathetic for, 364
 symptoms of, 361
 treatment of, 363, 364, 365

- Goitre, exophthalmic, with unilateral eye symptoms, 434
 Gonococcus infection in diseases of the conjunctiva, 368
 Gonorrhœa in women, 182
 treatment of, 186
 Gout, 347
 clinical relations of, 349
 etiology of, 347
 pathology of, 347
 relationship of obesity, diabetes mellitus and, 315
 Grafting, sponge-, after enucleation of the eye, 440
 Grafts, epithelial, of mucous membrane for pterygium, 379
 Gravity, specific, of the blood, 252
 Gumma of the conjunctiva, 379
 of the eyelids, 426
 Gummata of the ciliary body, 391
 Gymnastics, respiratory, in treatment of anæmia, 275
 Gynecology, 141

- H**ÆMOGLOBIN, estimation of iron and, in the blood, 250
 injections of, in treatment of anæmia, 275
 proteid constituents of, 265
 Hæmoglobinuria, paroxysmal, 303
 Hæmolysis, 258
 Hæmophilia, 303
 Hallucinations, visual, in ocular disease, 411
 Hammers, Halsted's miniature, for suture of the common duct, 52
 Hancock, operation of, for glaucoma, 422
 Harris, method of, of circular enterorrhaphy, 80
 Hemianopsia, 409
 Hemorrhage of the retina, 401
 tubo-ovarian, resembling ectopic pregnancy, 229
 Hemorrhages into the inner ear in leukaemia, 287
 intra-ocular, 402
 Hepatic disease, the relationship of diabetes and, 318
 Hernia, Ball's method of operation for, 87
 Bloodgood's method for the cure of, 96
 Champonnière's method for the cure of, 93
 Deaver's modified operation for the cure of, 94
 epigastric, 109
 femoral, 107
 final results of operations for, during the last decade, 113
 following appendicitis, 109
 general literature on, 110
 indications for operation in, 110
 inguinal, Fowler's method for the cure of, 91
 in the female, 106
 Lannelongue's injection method of zinc chloride for the cure of, 93

- Hernia, lateral, of small intestine, 87**
 new methods of operation for, 96
 of appendix, 87
 of cæcum and appendix, 86
 operative treatment of, 84
 in infants, 102
 post-operative, condition of abdominal wall as predisposing to, 175
 influence of abdominal bandage on, 177
 in gynecological operations, 151
 length of incision in regard to, 176
 operation for, 178
 predisposing factors to the production of, 173
 relationship of methods of closing the abdominal wound to, 169
 site of, 178
 symptoms accompanying, 178
 time of appearance of, 173
 production of, in abdominal operations, 171
 relapses in operations for, 109
 results of operation for, 88
 in children, 103
 suture material for operations in, 105
 umbilical, and ventral, 108, 110
- Herpes of the eyelids, 426**
- Histogenesis of dermoid cysts and teratomata of the ovary, 159**
- Hodgkin's disease, 297**
- Holocaine in ophthalmic surgery, 448**
- Humor, vitreous, 420**
- Hyaloid canal, 420**
 cysts of, 420
- Hydræmia, 261**
- Hydrophthalmos, 424**
- Hypoleucocytosis caused by substances preventing coagulation, 268**
- Hypopyon, keratitis, 382**
- Hysterectomy, abdominal, 239**
 vaginal, 239
 ultimate results in, for inflammatory disease, 241, 242
- Hystero-myomectomy, abdominal, ultimate results in, 244**
 shall the healthy ovary be removed in, 152
- Hystero-myotomy, vaginal, ultimate results in cases of, 242**
- IDIOCY, amaurotic family, eye lesions in, 399**
- Incision, length of, in regard to post-operative hernia, 176**
 line of, in abdominal operations, 170
 in gynecological operations, 179
- Incisions, abdominal, 22**
- Indications for gastrectomy, 25**
 for gastro-enterostomy, 28
 for operation in hernia, 110
 for surgical intervention in gastric ulcer, 45
- Instruments, sterilization of, in ophthalmology, 448**
- Internal ophthalmoplagia, recurring, 390**
- Intestinal anastomosis, Laplace's new forceps for, 74**
 the value of mechanical aids, 69
 paralysis, treatment of, by enterostomy, 24
 perforations, laparotomy for, in typhoid fever, 130
- Intestine, inflated rubber cylinder for circular suture of, 71**
 new method of resection of pylorus and, 35
 resection of, for cancer, 136
 small, lateral hernia of, 87
- Intoxication, auto-, amblyopia from, 408**
- Intra-cranial lesions in relationship to polyuria, 346**
- Intra-ocular hemorrhages, 402**
 tension, influence of accommodation on, 424
- Introductory to ophthalmology, 367**
- Intussusception, laparotomy for, 136**
- Iodoform, amblyopia from, 408**
 injections of, in exophthalmic goitre, 365
- Iodothyryl, the use of, in exophthalmic goitre, 364**
- Infantile scurvy, 299**
 treatment of, 300
- Infants, operative treatment of hernia in, 102**
- Infection, gonococcus, in diseases of the conjunctiva, 368**
- Inflammatory disease, ultimate results in vaginal hysterectomy for, 241**
- Inguinal hernia. See Hernia, inguinal.**
- Injection, Lannelongue's method of zinc chloride, for the cure of hernia, 93**
- Injections, hæmoglobin, in treatment of anemia, 275**
 iodoform, in exophthalmic goitre, 365
- Injuries of the nervous system, the relationship of diabetes with, 316**
- Iridoplegia, unilateral reflex, 390**
- Iris, 388**
 lymph-channels of, 390
 movements of, 389
- Iritis, 388**
 treatment of, 389
- Iron, estimation of hæmoglobin and, in the blood, 250**
 the absorption of, in relation to its use in anemia, 272
- KERATECTOMY, total combined, 440**
- Keratitis, bullous, 384**
 hypopyon, 382
 neuropathic, 385
 phlyctenular, 383
 treatment of, 384
 trophic, 384
- Keratoconus, 388**
- Keratoglobus, 387**
- Knee-jerk, absence of, in diabetes, 328**
- LACHRYMAL apparatus, 430**
 glands, syphilitic enlargement of, 431
 tumors of, 430

- Lachrymal passages, diseases of, 431
 treatment, 431, 432, 433
 sac, extirpation of, 432
 miscellaneous literature on diseases of, 433
- Lannelongue, injection method of zinc chloride of, for the cure of hernia, 93
- Laparotomy, 130
 emphysema of the abdominal wall after, 225
 for gunshot wounds of the abdomen, 133
 for intestinal perforation in typhoid fever, 130
 for intussusception, 136
 for tuberculous peritonitis, 137
- Laparotomies, stability of cicatrix after repeated, 179
- Laplace, new forceps of, for intestinal anastomosis, 74
- Lead-poisoning, amblyopia from, 408
- Lehmann, quantitative method of, for sugar in the urine, 342
- Lens, crystalline, 411
 ossification of, 420
- Lesions, eye, in amaurotic family idiocy, 399
 intra-cranial, in relation to polyuria, 346
- Leucocytes, origin and classification of, 254
- Leucocytosis, 266
 changes in the blood in, 268
 digestive, in disease, 268
 significance of, 267
 value of artificial, 267
- Leucosarcoma of the choroid, 392
- Leukæmia, 284
 acute, 293
 changes in the nervous system in, 291
 congenital, 287
 etiology of, 284
 hemorrhages into the inner ear in, 287
 in children, 285
 metabolism in, 288
 sporozoa in, 286
 treatment of, 293
- Ligament, round, vaginal shortening of, 202
- Ligaments, round, Edebohls' method of shortening, 207
- Ligation of the internal carotid artery, blindness from, 401
- Lipoma of the orbit, 436
- Literature, general, on hernia, 110
- Liver, abscess of, 67
 diseases of, and gall-bladder, 65
 echinococcus cysts of, 68
 relation between and glycosuria, 340
 surgery of, 63
 tumors of, 63
- Lymph-channels of the iris, 390
- Lymphangiectasia of the conjunctiva, 379
- Lymphatic system, diseases of, 249
- Lymphoma of the orbits and lids, 438
- MAMMARY extract, myoma uteri treated by thyroid and, 248
- Massage for glaucoma, 423
- Mechanical aids, value of, in intestinal anastomosis, 69
- Mechanism of accommodation, 453
- Melano-sarcoma, of the conjunctiva, 380
- Menopause, ovarian extract in the treatment of symptoms occurring during the artificial and natural, 155
- Menstruation, influence of castration upon, 142
 relationship of ovulation and, 143
 synchronicity between ovulation and, 232
- Metabolic diseases, 249
- Metabolism, disorders of, 306
 in leukæmia, 288
- Metastatic carcinoma of the choroid, 393
- Method, Ball's, of operation for hernia, 87
- Bloodgood's, for the cure of hernia, 96
- Champonnière's, for the cure of hernia, 93
- Edebohls', of shortening the round ligament, 207
- Fowler's, for the cure of inguinal hernia, 91
- Fröhlich's methylene-blue, for examining urine for sugar, 342
- Harris' circular, for enterorrhaphy, 80
- Lannelongue's injection of zinc chloride for the cure of hernia, 93
- Lehmann's, for quantitative estimation of sugar in the urine, 342
- of suture in abdominal operations, 181
- Methods, new, of operation for hernia, 96
 of closing the abdominal wound and their relationship to post-operative hernia, 169
 of examining the urine in glycosuria, 342
- Methylene-blue, Fröhlich's method, for examining urine for sugar, 342
- Modifications of Mule's operation, 439
- Molimina menstrualia, 144
- Movements of the eyes, complexity of, 456
- Mule, operation of, and modifications of it, 439
- Murphy's button, 34, 69
- Muscles, the extra-ocular, 454
- Mydriatics, dermatitis from, 427
 in glaucoma, 423
- Myoma uteri treated by mammary and thyroid extract, 248
- Myopia, high, the operative treatment of, 451
 non-operative treatment of, 453
- Myxædema, 353
 etiology, 353
 relation between scleroderma and, 353
 symptoms of, 357
- NERVE, optic, diseases of the retina and head of, 396
- Nerve tracts, optic, 409
- Nervous diseases, the relationship of, with diabetes, 316
- M**ALIGNANT disease of the stomach, 26
 surgery of, of the rectum, 137
 the relationship of, to Addison's disease, 307

- Nervous lesions in pernicious anemia, 283
 system, changes in, in leukemia, 291
 influence of castration upon, 150
 the relationship of diabetes with
 injuries to, 316
- Neuritis, optic, 397
- Neuropathic keratitis, 385
- Neuro-retinitis of anemia, 397
- O**BESITY, 350
 the relationship of gout, diabetes and,
 315
 thyroid treatment of, 350
- Ocular disease, visual hallucinations in, 411
- Olshausen, operative treatment of retro-
 flexion of the uterus as summarized
 by, 197
 summary of symptoms of retroflexion
 of uterus by, 194
- Opacities, corneal, 385
- Operation, Alexander, comparison of sus-
 pensio uteri and, 220
 Ball's method of, for hernia, 87
 cataract, delayed union after, 417
 Deaver's modified, for the cure of her-
 nia, 94
 for post-operative hernia, 178
 Hancock's, for glaucoma, 422
 Mule's, and modifications of it, 439
 new methods of, for hernia, 96
 of suspensio uteri, 215
 radical, for carcinoma uteri, 234
- Operations, abdominal, examination of ci-
 catrrix after, 172
 line of incision in, 170
 production of hernia in, 171
- cataract, 414
 secondary, 419
 conservative, upon the ovaries and
 tubes, 247
 gynecological, post-operative hernia in,
 151
 hernia, final results of, during the last
 decade, 113
 indications for, 110
 results of, 88
 on the sympathetic nervous system for
 exophthalmic goitre, 364
 stomach, results of at Czerny's clinic, 33
 suture material in, 105
- Ophthalmitis, sympathetic, 394
- Ophthalmology, 367
 antiseptics in, 447
 local anæsthesia in, 448
 special therapeutic measures in, 450
 the use of pilocarpine in, 451
 suprarenal extract in, 450
- Ophthalmoplegia, recurring internal, 390
- Ophthalmoscope, evidence of general ar-
 terial disease by, 402
- Optic nerve, diseases of the retina and head
 of, 396
 tracts and centres, 409
 neuritis, 397
- Orbit, cystic tumor of, 435
 dermoid cyst of, 435
- Orbit, foreign bodies in the eye and, 441
 localization of, 441
 tumors of, 435-439
- Organs, sexual, the influence of castration
 upon, 149
- Origin and classification of leucocytes, 254
- Ossification of the lens, 420
- Osteoma of the orbit, 439
- Osteomalacia, 352
- Ovarialis endometritis hyperplastica, 231
- Ovarian extract in the treatment of symp-
 toms occurring during the artificial and
 natural menopause, 155
- Ovaries, conservative operations upon the
 tubes and, 247
 transplantation of, 157
- Ovary, dermoid cysts of, histogenesis of,
 159
 shall the healthy be removed in hy-
 tero-myomectomy, 152
 teratomata of, histogenesis of, 159
- Ovulation, relationship of menstruation and,
 143
 synchronicity between menstruation
 and, 232
- P**ANCREAS, cancer of, and glycosuria,
 322
- Pancreatic disease and diabetes, 322
- Paralysis, intestinal, treatment of, by enter-
 ostomy, 24
- Parinaud, conjunctivitis of, 374
- Parasitism, the relation of, to anæmias, 282
- Paroxysmal hæmoglobinuria, 303
- Passages, lachrymal, diseases of, 431
- Pathology of gout, 347
 of inflammation of the appendix, 129
- Pelvis, condition of the blood in septic
 diseases of the abdomen and, 271
- Perforation, intestinal, laparotomy for, in
 typhoid fever, 130
- Peritoneum, tuberculosis of, 187
 prognosis of, 189
 symptoms of, 188
 treatment of, 189
 types of, 188
- Peritonitis, treatment of, by enterostomy,
 24
 tuberculous, laparotomy for, 137
- Perivaginitis phlegmonosa dissecans, 227
 following typhoid, 228, 229
- Pernicious anemia, 279
 Addisonian, 282
- Phenylhydrazin test for examining the
 urine in glycosuria, 342
- Phlegmonosa perivaginitis dissecans, 227
- Phlyctenular keratitis, 383
- Phthisis bulbi, sarcoma of choroid with,
 392
- Pigmentary cachexia consecutive to pur-
 pura, 299
- Pigmentosa retinitis and allied conditions,
 400
- Pilocarpine, the use of, in ophthalmology,
 451
- Plasma, blood, altered conditions of, 266

Pneumococcus conjunctivitis, 372
 ulcer, serpent or, 381
 Poisoning, cocaine, exophthalmos a symptom of, 435
 Polar cataract, anterior, 412
 Polycythemia, 257
 Polyuria, intra-cranial lesions in relation to, 346
 Post-operative hernia in gynecologic operations, 151. *See also* Hernia, post-operative.
 Potassium permanganate in the treatment of conjunctivitis, 377
 Powder-stains of the eye, 430
 Pregnancy, albuminuric retinitis as a complication of, 396
 diabetes insipidus in, 347
 ectopic, tubo-ovarian hemorrhage resembling, 229
 influence of, upon post-operative cicatrix, 177
 Prognosis of albuminuric retinitis, 397
 of malignant disease of the stomach, 27
 of tuberculosis of the peritoneum, 189
 Protargol in treatment of conjunctivitis, 375
 Proteid constituents, of hæmoglobin, 265
 Pseudo-tumor of choroid, 394
 Psychical system, influence of castration upon, 150
 Pterygium, 378
 treatment of, 378, 379
 Ptosis, operations for, 427
 Pupil, 388
 Pupillary changes, 389
 Purpura, 298
 pigmentary cachexia consecutive to, 299
 Pylorus, new method of resection of, and intestine, 35

QUININE amaurosis, 405

RECTUM, surgery of, malignant disease of, 137

Red corpuscles *See* Corpuscles, red.
 Reflex iridoplegia, unilateral, 390
 Refraction and accommodation, 451
 Relapses in operations for hernia, 109
 Relation between myxœdema and scleroderma, 350
 clinical, of gout, 349
 of acetone elimination to diet, 327
 of digestion to diabetes, 328
 Relationship of diabetes, gout and obesity, 315
 of hepatic disease and diabetes, 318
 of intra-cranial lesions to polyuria, 346
 of nervous diseases and injuries to the nervous system with diabetes, 316
 of renal disease and diabetes, 319
 of syphilis with diabetes, 317
 Removal of calculi from the common duct by the duodenal route, 62

Renal disease, the relationship of, and diabetes, 319
 Resection of the cervical sympathetic for glaucoma, 421
 of the intestine for cancer, 136
 of the pylorus and intestine, new method of, 35
 of the stomach, 32
 Respiratory gymnastics in treatment of anemia, 275
 Results of cataract extraction 419
 ultimate, in abdominal hysteromyomectomy, 244
 hystero-myotomy, 244
 in vaginal hysteromyotomy, 242
 hysterectomy for inflammatory disease, 241
 of operation of suspensio uteri, 216
 Retina, detachment of, 403
 treatment of, 404
 diseases of the head of the optic nerve and, 396
 vascular disease and hemorrhage of 401
 Retinal artery, central, thrombosis of, 401
 Retinitis, albuminuric. 396
 prognosis of, 397
 chorio-, 391
 circinata, 398
 neuro-, of anemia, 397
 pigmentosa and allied conditions, 400
 Retroflexion of uterus, American views on, 206
 Baumm's views on the operative treatment of, 202
 brief résumé and criticism of, 221
 Dührssen's radical views on, 201
 European views relative to, 190, 192
 operative treatment as summarized by Olshausen, 197
 Schultze's views on, 192
 shortening the round ligament, 202
 suspensio uteri for, 214
 symptomatology, Winter's views on, 198
 symptoms, Olshausen's summary of, 194
 Theilhaber's conservative views, 200
 treatment, general and local, résumé and criticism of, 222
 operative, résumé and criticism of, 224
 views of various German gynecologists on, 203
 Rheumatoid arthritis, 351
 scleroderma associated with, 353
 Roentgen rays, localization of foreign bodies in the eye and orbit by, 441
 Round-cell sarcoma of the orbit, 437
 Round ligaments, Edebohls' method of shortening, 207
 vaginal shortening of, 202
 Rotation of the eyeballs, anomalies of, 456
 Roux's gastro-enterostomy "en Y," 41

- Rubber gloves, the use of, in abdominal surgery, 21
- Rupture of the spleen, 305
- SAC**, lachrymal, extirpation of, 432
- miscellaneous literature on diseases of, 433
- Saemisch section for corneal ulcer, 382
- Saline transfusion in diabetic coma, 334
- Sarcoma, glio-, 436
- of choroid with phthisis bulbi, 392
- of ciliary body, 392
- of orbit, 436
- melano-, of conjunctiva, 380
- round-cell, of orbit, 437
- spindle-cell of conjunctiva, 380
- Schirrus carcinoma of the lachrymal gland, 430
- Schultze, views of, on retroflexion of the uterus, 192
- Scleroderma, 353
- associated with rheumatoid arthritis, 353
- relation between myxœdema and, 353
- Scurvy, infantile, 299
- treatment of, 300
- Secondary anemia, 270
- Section, Saemisch, for corneal ulcer, 382
- Senile cataract, 413
- Septic diseases of the abdomen and pelvis, condition of the blood in, 271
- Serpent or pneumococcus ulcer, 381
- Serum, altered condition of the blood-, 266
- Sexual function, influence of castration upon, 145
- organs, influence of castration upon, 149
- Shape and character of gallstones, 56
- Shortening the round ligaments, Edebohls' method of, 207
- vaginal, of the round ligament, 202
- Sideroscope for extracting foreign bodies in eye, 444
- Significance of alkalinity of the blood, 265
- of eosinophilia, 269
- of leucocytosis, 267
- Specific gravity of the blood, 252
- Spleen, diseases of, 249
- rupture of, 305
- pulp, administered after splenectomy, 305
- Splenectomy, effects of, 305
- use of pulp of calf's spleen after, 305
- Splenic anemia, 288
- Sponge-grafting after enucleation of the eye, 440
- Sporozoa in leukemia, 286
- Squint, convergent, treatment of, 454
- Staining, blood, 249
- Stains, powder-, of the eye, 439
- Stereoscope in convergent squint, 455
- Sterilization of instruments in ophthalmology, 448
- of conjunctiva, 447
- Stomach, complete removal of, 25
- malignant disease of, 26
- resection of, 32
- Stomach, results of operations of, at Czerny's clinic, 33
- surgery of, 25
- Strontium bromide in exophthalmic goitre in children, 365
- iodide in exophthalmic goitre in children, 365
- Suprarenal extract in ophthalmology, 450
- in treatment of Addison's disease, 309, 311
- Surgical treatment of gastric ulcer, 44
- Surgery, abdominal, the use of drainage in, 17
- rubber gloves in, 21
- of abdomen, 17
- of abdominal cavity, 17
- of bile-ducts, 52
- of colon, 49
- of duodenum, 46
- of gall bladder and bile-ducts, 50
- of liver, 63
- of malignant diseases of rectum, 137
- of stomach, 25
- Suspensio uteri, ultimate results of, 216
- Suspension of uterus, 214
- operation for, 215
- Suture of common duct, advisability of, 53
- Halsted's miniature hammers for, 52
- of cornea, 388
- inflated rubber cylinder for circular, of intestine, 71
- material for operations in hernia, 105
- method of, for gynecological operations, 179, 181
- Sympathetic, cervical, resection of, for glaucoma, 421
- nervous system, operations on, for exophthalmic goitre, 364
- ophthalmitis, 394
- Symptomatology of retroflexion of uterus, Winter's views on, 198
- Symptoms accompanying Addison's disease, 308
- and types of tuberculosis of peritoneum, 188
- eye, exophthalmic goitre with unilateral, 434
- gastro-intestinal, of chlorosis, 278
- occurring during the natural and artificial menopause, ovarian extract in the treatment of, 155
- of diabetes, 324
- of exophthalmic goitre, 361
- of myxœdema, 357
- of post-operative hernia, 178
- of retroflexion of uterus, Olshausen's summary of, 194
- Synchronicity between ovulation and menstruation, 232
- Syphilis, relation of, to diabetes, 317
- Syphilitic enlargement of the lachrymal gland, 431
- System, arterial, tension of the general, in glaucoma, 424
- lymphatic, diseases of, 249
- nervous, changes in, in leukemia, 291

System, nervous, influence of castration upon, 150
 relationship of diabetes with injuries to, 316
 psychological, influence of castration upon, 150
 sympathetic nervous, operations on, for exophthalmic goitre, 364

TARSITIS, 425

Tarsus, removal of retrotarsal fold and, for trachoma, 377
 Tea drinking, amblyopia from, 408
 Tension, intra-ocular, influence of accommodation on, 424
 of the general arterial system in glaucoma, 424
 Teratomata of the ovary, histogenesis of, 159
 Test, phenylhydrazin, for urine in glycosuria, 342
 Tests for diabetic urine, 326
 Tetany and the causation of cataract, 412
 Theilhaber, conservative views of, on retroflexion of the uterus, 200
 Therapeutic effect of castration, 151
 measures, in ophthalmology, 450
 Therapy, pathology and, of inflammation of the appendix, 129
 Thrombosis, in chlorosis, 277
 of the central retinal artery, 401
 Thymus, extract of, use of in exophthalmic goitre, 364
 Thyroid extract, myoma uteri treated by mammary and, 248
 use of, in exophthalmic goitre, 364
 gland, diseases of, 249
 treatment of obesity, 350
 Thyroidectomy, for exophthalmic goitre, 363
 Thyroidin, the use of, in exophthalmic goitre, 364
 Tobacco amblyopia, 407
 Toluidin-blue, use of, in corneal ulcer, 381
 Toxic amblyopias, 405
 Trachoma, 372
 removal of tarsus and retrotarsal fold for, 377
 Tracts, optic nerve, and centres, 409
 Transfusion, saline, in diabetic coma, 334
 Transplantation, of the ovaries, 157
 Traumatic cataract, 411
 Treatment, Deaver's plan of, in appendicitis, 120
 general, of corneal ulcers, 383
 general and local, of retroflexion of the uterus, résumé and criticism of, 222
 non-operative of myopia, 453
 of Addison's disease, 309
 of anæmia, injections of hæmoglobin in, 275
 respiratory gymnastics in, 275
 of anæmic conditions, 272
 of appendicitis, French views on, 121

Treatment of appendicitis, Richardson and Brewster's views on, 114, 115
 of bullous keratitis, 384
 of chalazion, 429
 of chlorosis, 279
 of conjunctivitis, 372, 374
 of convergent squint, 454
 of detachment of retina, 404
 of diabetes, 329
 of diabetic coma, 334
 of diseases of the lachrymal passages and sac, 431, 432, 433
 of ectropion, 428
 of entropion, 428
 of exophthalmic goitre, 363, 364, 365
 of glaucoma, 421
 of gonorrhœa in women, 186
 of high myopia, 451
 of intestinal paralysis and peritonitis by enterostomy, 24
 of iritis, 389
 of leukæmia, 293
 of myoma uteri, by mammary and thyroid extract, 248
 of pernicious anæmia, 284
 of pterygium, 378, 379
 of retroflexion of the uterus as summarized by Olshausen, 197
 of tuberculosis of the bladder, 189
 open-wound of cataract, 418
 operative, of hernia, 84
 in infants, 102
 of retroflexion of the uterus, résumé and criticism of, 224
 ovarian extract in symptoms occurring during the artificial and natural menopause, 155
 surgical, of gastric ulcer, 44
 thyroid, of obesity, 350
 Trichinosis, eosinophilia in, 269
 Trophic keratitis, 384
 Tuberculosis of the peritoneum, 187
 prognosis of, 189
 symptoms of, 188
 treatment of, 189
 types of, 188
 Tubes, Fallopian, conservative operations upon the ovaries and, 247
 fusion-, for convergent squint, 455
 Tubo-ovarian hemorrhage resembling ectopic pregnancy, 229
 Tumor, cystic, of the orbit, 435
 Tumors of choroid, 392
 of ciliary body, 391
 of conjunctiva, 379, 380
 of lachrymal gland, 430
 of liver, 63
 of orbit, 435
 Type, carcinoma of epithelial, 166
 clinical aspect of, 167
 of glandular, 166
 clinical aspect of, 167
 Typhoid fever, laparotomy for intestinal perforations in, 130
 perivaginitis phlegmonosa disse-cans following, 228, 229

- ULCER**, corneal, 381
 perforating, of the duodenum, 46
 gastric, surgical treatment of, 44
 serpent, or pneumococcus, 381
- Umbilical hernia.** *See* Hernia, umbilical.
- Unilateral reflex iridoplegia**, 390
- Urine**, diabetic tests for, 326
 Fröhlich's methylene-blue method for
 examining for sugar in, 342
 Lehmann's quantitative method for
 examining for sugar in, 342
 methods of examining, in glycosuria,
 342
- Uterus**, carcinoma of, radical operation for,
 234
 myoma of, treated by mammary and
 thyroid extract, 248
 retroflexion of, 190. *See also* Retro
 flexion of the uterus.
- VAGINAL** hysterectomy, 239. *See also*
 Hysterectomy, vaginal.
 hystero myotomy. *See* Hystero-myot-
 omy, vaginal.
- Vaginitis**, peri-, phlegmosa dissecans, 227
 following typhoid fever, 228, 229
- Value of artificial leucocytosis**, 267
- Vascular disease**, retinal, 401
- Ventral hernia.** *See* Hernia, umbilical and
 ventral.
- Visual hallucinations** in ocular disease,
 411
- Vitreous humor**, 420
- WALL**, abdominal, emphysema of, after
 laparotomy, 225
- White blood-corpuscles.** *See* Leucocytes.
- Winter**, views of, on symptomatology of
 retroflexion of the uterus, 198
- Women**, gonorrhœa in, 182
- Word-blindness**, 411
- Wound**, abdominal, methods of closing and
 their relationship to post-operative her-
 nia, 169
- Wounds**, gunshot, of the abdomen, lapa-
 rotomy for, 133
- XANTHOMA**, diabetic, 320
- ZINC** chloride, Lannelongue's injection
 method for the cure of hernia, 93

Catalogue of Books

PUBLISHED BY

Lea Brothers & Company,



708, 708 & 710 Sansom St., Philadelphia.
111 Fifth Avenue, New York.

The books in the annexed list will be sent by mail, post-paid, to any Post-Office in the United States, on receipt of the printed prices. No risks of the mail, however, are assumed either on money or books. Intending purchasers will therefore in most cases find it more convenient to deal with the nearest bookseller.

STANDARD MEDICAL PERIODICALS.

Progressive Medicine.

A Quarterly Digest of New Methods, Discoveries and Improvements in the Medical and Surgical Sciences by Eminent Authorities. Edited by DR. HOBART AMORY HARE. In four abundantly illustrated, cloth bound, octavo volumes of 400-500 pages each, issued quarterly, commencing March 1, 1899. Per annum (4 volumes), \$10.00, delivered.

The Medical News.

WEEKLY, \$4.00 PER ANNUM.

Each number contains 32 quarto pages, abundantly illustrated. A crisp, fresh weekly professional newspaper.

The American Journal of the Medical Sciences.

MONTHLY, \$4 00 PER ANNUM.

Each issue contains 128 octavo pages, fully illustrated. The most advanced and enterprising American exponent of scientific medicine.

The Medical News Visiting List for 1899.

Four styles, Weekly (dated for 30 patients); Monthly (undated, for 120 patients per month); Perpetual (undated, for 30 patients weekly per year; and Perpetual (undated, for 60 patients weekly per year). Each style in one wallet-shaped book, leather bound, with pocket, pencil and rubber. Price, each, \$1.25. Thumb-letter index, 25 cents extra.

The Medical News Pocket Formulary for 1899.

Containing 1600 prescriptions representing the latest and mostly approved methods of administering remedial agents. Strongly bound in leather, with pocket and pencil. Price, \$1.50, net.

COMBINATION RATES.

	ALONE.	IN COMBINATION.
Per Annum American Journal of the Medical Sciences.....	\$4.00	} \$7.50 } \$15.00
Medical News.....	4.00	
Progressive Medicine.....	10.00	
Medical News Visiting List.....	1.25	
Medical News Formulary	1.50, net.	

In all \$20.75 for \$16.00

First four above publications in combination.....\$15.75

All above publications in combination..... 16.00

Other Combinations will be quoted on request. Full Circulars and Specimens free.

ABBOTT A. C. . *PRINCIPLES OF BACTERIOLOGY*: a Practical Manual for Students and Physicians. New 4th edition enlarged and thoroughly revised. In one handsome 12mo. volume of 543 pages, with 106 engravings, of which 19 are colored. Cloth, \$2.75.

ALLEN HARRISON . *A SYSTEM OF HUMAN ANATOMY; WITH AN INTRODUCTORY SECTION ON HISTOLOGY*, by E. O. SHAKESPEARE, M.D. Comprising 913 double-columned quarto pages, with 380 engravings on stone on 109 full-page plates, and 241 woodcuts. One volume, cloth, \$23. *Sold by subscription only.*

A TREATISE ON SURGERY BY AMERICAN AUTHORS. FOR STUDENTS AND PRACTITIONERS OF SURGERY AND MEDICINE. Edited by ROSEWELL PARK, M.D. In two magnificent octavo volumes. Vol. I., *General Surgery*, 799 pages, with 356 engravings and 21 full-page plates in colors and monochrome. Vol. II., *Special Surgery*, 796 pages, with 451 engravings and 17 full-page plates in colors and monochrome. *Complete work now ready.* Price per volume, cloth, \$4.50; leather, \$5.50. *Net.*

AMERICAN SYSTEM OF PRACTICAL MEDICINE. A SYSTEM OF PRACTICAL MEDICINE. In Contributions by Eminent American Authors. Edited by ALFRED L. LOOMIS, M.D., LL.D., and W. GILMAN THOMPSON, M.D. In four very handsome octavo volumes of about 900 pages each, fully illustrated. *Complete work just ready.* Per volume, cloth, \$5; leather, \$6; half Morocco, \$7. *For sale by subscription only.* Prospectus free on application.

AMERICAN SYSTEM OF DENTISTRY. IN TREATISES BY VARIOUS AUTHORS. Edited by WILBUR F. LITCH, M.D., D.D.S. In four very handsome super-royal octavo volumes, containing about 4000 pages, with about 2200 illustrations and many full-page plates. Volume IV., *preparing.* Per volume, cloth, \$6; leather, \$7; half Morocco, \$8. *For sale by subscription only.* Prospectus free on application to the Publishers.

AMERICAN TEXT-BOOK OF ANATOMY. See *Gerrish*, page 7.

AMERICAN TEXT-BOOKS OF DENTISTRY. IN CONTRIBUTIONS BY EMINENT AMERICAN AUTHORITIES. In two octavo volumes of 600-800 pages each, richly illustrated:

— *PROSTHETIC DENTISTRY.* Edited by CHARLES J. ESKIG, M.D., D.D.S., Professor of Mechanical Dentistry and Metallurgy, Department of Dentistry, University of Pennsylvania, Philadelphia. 760 pages, 983 engravings. Cloth, \$6; leather, \$7. *Net.*

— *OPERATIVE DENTISTRY.* Edited by EDWARD C. KIRK, D.D.S., Professor of Clinical Dentistry, Department of Dentistry, University of Pennsylvania. 700 pages, 751 engravings. Cloth, \$5.50; leather, \$6.50. *Net.*

AMERICAN SYSTEMS OF GYNECOLOGY AND OBSTETRICS. In treatises by the most eminent American specialists. Gynecology edited by MATTHEW D. MANN, A.M., M.D., and Obstetrics edited by BARTON C. HIRST, M.D. In four large octavo volumes comprising 3612 pages, with 1092 engravings, and 8 colored plates. Per volume, cloth, \$5; leather, \$6; half Russia, \$7. *For sale by subscription only.* Prospectus free.

ASHHURST (JOHN, JR.). THE PRINCIPLES AND PRACTICE OF SURGERY. For the use of Students and Practitioners. Sixth and revised edition. In one large and handsome 8vo. volume of 1161 pages, with 656 engravings. Cloth, \$6; leather, \$7.

A SYSTEM OF PRACTICAL MEDICINE BY AMERICAN AUTHORS. Edited by WILLIAM PEPPER, M.D., LL.D. In five large octavo volumes, containing 5573 pages and 198 illustrations. Price per volume, cloth, \$5; leather, \$6; half Russia, \$7. *Sold by subscription only.* Prospectus free on application to the Publishers.

A PRACTICE OF OBSTETRICS BY AMERICAN AUTHORS. See *Jewett*, page 9.

ATTFIELD (JOHN). CHEMISTRY; GENERAL, MEDICAL AND PHARMACEUTICAL. Fourteenth edition, specially revised by the Author for America. In one handsome 12mo. volume of 794 pages, with 88 illustrations. Cloth, \$2.75; leather, \$3.25.

BALL (CHARLES B.). THE RECTUM AND ANUS, THEIR DISEASES AND TREATMENT. New (2d) edition. In one 12mo. volume of 453 pages, with 60 engravings and 4 colored plates. Cloth, \$2.25. See *Series of Clinical Manuals*, page 13.

Philadelphia, 708, 708 and 710 Sansom St.—New York, 111 Fifth Avenue.

- BARNES (ROBERT AND FANCOURT).** *A SYSTEM OF OBSTETRIC MEDICINE AND SURGERY, THEORETICAL AND CLINICAL.* The Section on Embryology by PROF. MILNES MARSHALL. In one large octavo volume of 872 pages with 231 illustrations. Cloth, \$5; leather, \$6.
- BACON (GORHAM) AND BLAKE (CLARENCE J.).** *ON THE EAR.* One 12mo. volume, 398 pages, with 109 engravings and one colored plate. *Just Ready.* Cloth, \$2, *net.*
- BARTHOLOW (ROBERTS).** *CHOLERA; ITS CAUSATION, PREVENTION AND TREATMENT.* In one 12mo. volume of 127 pages, with 9 illustrations. Cloth, \$1.25.
- BARTHOLOW (ROBERTS).** *MEDICAL ELECTRICITY. A PRACTICAL TREATISE ON THE APPLICATIONS OF ELECTRICITY TO MEDICINE AND SURGERY.* Third edition. In one octavo volume of 308 pages, with 110 illustrations.
- BELL (F. JEFFREY).** *COMPARATIVE ANATOMY AND PHYSIOLOGY.* In one 12mo. volume of 561 pages, with 229 engravings. Cloth, \$2. See *Students' Series of Manuals*, p. 14.
- BERRY (GEORGE A.).** *DISEASES OF THE EYE; A PRACTICAL TREATISE FOR STUDENTS OF OPHTHALMOLOGY.* Second edition. Very handsome octavo volume of 745 pages, with 197 original illustrations in the text, of which 87 are exquisitely colored. Cloth, \$8.
- BILLINGS (JOHN S.).** *THE NATIONAL MEDICAL DICTIONARY.* Including in one alphabet English, French, German, Italian and Latin Technical Terms used in Medicine and the Collateral Sciences. In two very handsome imperial octavo volumes, containing 1574 pages and two colored plates. Per volume, cloth, \$6; leather, \$7; half Morocco, \$8.50. *For sale by subscription only.* Specimen pages on application.
- BLACK (D. CAMPBELL).** *THE URINE IN HEALTH AND DISEASE, AND URINARY ANALYSIS, PHYSIOLOGICALLY AND PATHOLOGICALLY CONSIDERED.* In one 12mo. volume of 256 pages, with 73 engravings. Cloth, \$2.75.
- BLOXAM (C. L.).** *CHEMISTRY, INORGANIC AND ORGANIC.* With Experiments. New American from the fifth London edition. In one handsome octavo volume of 727 pages, with 292 illustrations. Cloth, \$2; leather, \$3.
- BRICKNER (SAMUEL M.)** *ON THE SURGICAL PATIENT.* *Preparing.*
- BROADBENT (W. H.).** *THE PULSE.* In one 12mo. volume of 317 pages, with 59 engravings. Cloth, \$1.75. See *Series of Clinical Manuals*, page 13.
- BROWNE (LENNOX).** *THE THROAT AND NOSE AND THEIR DISEASES.* New (4th) and enlarged edition. In one imperial octavo volume of 751 pages, with 235 engravings and 120 illustrations in color. Cloth, \$6.50.
- *KOCH'S REMEDY IN RELATION ESPECIALLY TO THROAT CONSUMPTION.* In one octavo volume of 121 pages, with 45 illustrations, 4 of which are colored, and 17 charts. Cloth, \$1.50.
- BRUCE (J. MITCHELL).** *MATERIA MEDICA AND THERAPEUTICS.* New (6th) edition. In one 12mo. volume of 600 pages. *Shortly.* See *Students' Series of Manuals*, page 14.
- *PRINCIPLES OF TREATMENT.* In one octavo volume. *Preparing.*
- BRUNTON (T. LAUDER).** *A MANUAL OF PHARMACOLOGY, THERAPEUTICS AND MATERIA MEDICA;* including the Pharmacy, the Physiological Action and the Therapeutical Uses of Drugs. In one octavo volume.
- BRYANT (THOMAS).** *THE PRACTICE OF SURGERY.* Fourth American from the fourth English edition. In one imperial octavo volume of 1040 pages, with 727 illustrations. Cloth, \$6.50; leather, \$7.50.
- BUMSTEAD (F. J.) AND TAYLOR (B. W.).** *THE PATHOLOGY AND TREATMENT OF VENEREAL DISEASES.* See *Taylor on Venereal Diseases*, page 15.
- BURCHARD (HENRY H.).** *DENTAL PATHOLOGY AND THERAPEUTICS, INCLUDING PHARMACOLOGY.* Handsome octavo, 575 pages, with 400 illustrations. *Just ready.* Cloth, \$5; leather, \$6. (*Net.*)

- KERNETT CHARLES H. . THE EAR: ITS ANATOMY, PHYSIOLOGY AND DISEASES.** A Practical Treatise for the Use of Students and Practitioners. Seventh edition. In one octo. volume of 580 pages, with 107 illustrations. Cloth, \$4; leather, \$5.
- KUTLIN HENRY T. . DISEASES OF THE TONGUE.** In one pocket-size 12mo. volume of 40 pages, with 2 colored plates and 3 engravings. Limp cloth, \$3.50. See *Series of Clinical Manuals*, page 13.
- CARTER R. BRIDGEMAN AND FROST W. ADAMS. . OPHTHALMIC DISEASES.** In one pocket-size 12mo. volume of 559 pages, with 91 engravings and one plate. Cloth, \$2.50. See *Series of Clinical Manuals*, page 13.
- CASPARI CHARLES JR. . A TREATISE ON PHARMACY.** For Students and Practitioners. In one handsome octavo volume of 680 pages, with 288 illustrations. Cloth, \$4.50.
- CHAPMAN HENRY C. . A TREATISE ON HUMAN PHYSIOLOGY.** In one large volume of 727 pages, with 265 illustrations. Cloth, \$5.50; leather, \$6.50.
- CHARLES T. CRANSTON. . THE ELEMENTS OF PHYSIOLOGICAL AND PATHOLOGICAL CHEMISTRY.** In one handsome octavo volume of 451 pages, with 10 engravings and 1 colored plate. Cloth, \$3.50.
- CHEYKE W. WATSON. . THE TREATMENT OF WOUNDS, ULCERS AND ABSCESSSES.** In one 12mo. volume of 307 pages. Cloth, \$1.25.
- CHURCHILL FLEETWOOD. . ESSAYS ON THE PUERPERAL FEVER.** In one octavo volume of 404 pages. Cloth, \$2.50.
- CLARKE W. B. AND LOCKWOOD G. B. . THE DISSECTOR'S MANUAL.** In one 12mo. volume of 384 pages, with 49 engravings. Cloth, \$1.50. See *Students' Series of Manuals*, page 14.
- CLELAND JOHN. . A DIRECTORY FOR THE DISSECTION OF THE HUMAN BODY.** In one 12mo. volume of 175 pages. Cloth, \$1.25.
- CLINICAL MANUALS.** See *Series of Clinical Manuals*, page 13.
- CLOUSTON THOMAS S. . CLINICAL LECTURES ON MENTAL DISEASES.** New 3rd edition. Crown octo. of 736 pages with 19 colored plates. Cloth, \$3.50. See *Series of Clinical Manuals*.
- Best Plans for *Analysis of Laws of U.S. on Custody of Insane*, octavo, \$1.50, is sold in conjunction with *Manual on Mental Diseases* for \$5.00, net, for the two works.
- CLOWES FRANK. . AN ELEMENTARY TREATISE ON PRACTICAL CHEMISTRY AND QUALITATIVE INORGANIC ANALYSIS.** From the Fourth English edition. In one handsome 12mo. volume of 387 pages, with 55 engravings. Cloth, \$2.50.
- COAKLEY CORNELIUS G. . THE DIAGNOSIS AND TREATMENT OF DISEASES OF THE NOSE, THROAT, NASO-PHARYNX AND TRACHEA.** In one 12mo. volume of about 400 pages, fully illustrated. *Preparing*.
- COATS JOSEPH. . A TREATISE ON PATHOLOGY.** In one volume of 829 pages with 500 engravings. Cloth, \$5.50; leather, \$6.50.
- COLEMAN ALFRED. . A MANUAL OF DENTAL SURGERY AND PATHOLOGY.** With Notes and Additions to adapt it to American Practice. By THOS. C. STELLWAGEN, M.A., M.D., D.D.S. In one handsome octavo volume of 412 pages, with 361 engravings. Cloth, \$3.25.
- CONDIE D. FRANCIS. . A PRACTICAL TREATISE ON THE DISEASES OF CHILDREN.** Sixth edition, revised and enlarged. In one large 8vo. volume of 719 pages. Cloth, \$5.25; leather, \$6.25.
- CORNIL (V.). . SYPHILIS: ITS MORBID ANATOMY, DIAGNOSIS AND TREATMENT.** Translated, with Notes and Additions, by J. HENRY C. SMITH, M.D., and J. WILLIAM WHITE, M.D. In one 8vo. volume of 461 pages, with 84 illustrations. Cloth, \$3.75.
- CULBRETH DAVID M. E. . MATERIA MEDICA AND PHARMACOLOGY.** In one handsome octavo volume of 812 pages, with 445 engravings. Cloth, \$4.75.

- CULVER (E. M.) AND HAYDEN (J. R.).** *MANUAL OF VENEREAL DISEASES.* In one 12mo. volume of 289 pages, with 33 engravings. Cloth, \$1.75.
- DALTON (JOHN C.).** *A TREATISE ON HUMAN PHYSIOLOGY.* Seventh edition, thoroughly revised. Octavo of 722 pages, with 252 engravings. Cloth, \$5; leather, \$6.
- *DOCTRINES OF THE CIRCULATION OF THE BLOOD.* In one handsome 12mo. volume of 293 pages. Cloth, \$2.
- DAVENPORT (F. H.).** *DISEASES OF WOMEN.* A Manual of Gynecology. For the use of Students and General Practitioners. New (3d) edition. In one handsome 12mo. volume, 387 pages and 150 engravings. Cloth, \$1.75, *net.* Just Ready.
- DAVIS (F. H.).** *LECTURES ON CLINICAL MEDICINE.* Second edition. In one 12mo. volume of 287 pages. Cloth, \$1.75.
- DAVIS (EDWARD P.).** *A TREATISE ON OBSTETRICS.* For Students and Practitioners. In one very handsome octavo volume of 546 pages, with 217 engravings, and 30 full-page plates in colors and monochrome. Cloth, \$5; leather, \$6.
- DE LA BECHE'S GEOLOGICAL OBSERVER.** In one large octavo volume of 700 pages, with 300 engravings. Cloth, \$4.
- DENNIS (FREDERIC S.) AND BILLINGS (JOHN S.).** *A SYSTEM OF SURGERY.* In Contributions by American Authors. In four very handsome octavo volumes, containing 3652 pages, with 1585 engravings, and 45 full-page plates in colors and monochrome. *Complete work just ready.* Per volume, cloth, \$6; leather, \$7; half Morocco, gilt back and top, \$8.50. *For sale by subscription only.* Full prospectus free.
- DERCUM (FRANCIS X.), Editor.** *A TEXT-BOOK ON NERVOUS DISEASES.* By American Authors. In one handsome octavo volume of 1054 pages, with 341 engravings and 7 colored plates. Cloth, \$6; leather, \$7. (*Net.*)
- DE SCHWEINITZ (GEORGE E.).** *THE TOXIC AMBLYOPIAS; THEIR CLASSIFICATION, HISTORY, SYMPTOMS, PATHOLOGY AND TREATMENT.* Very handsome octavo, 240 pages, 46 engravings, and 9 full-page plates in colors. Limited edition, de luxe binding, \$4. (*Net.*)
- DRAPER (JOHN C.).** *MEDICAL PHYSICS.* A Text-book for Students and Practitioners of Medicine. Octavo of 734 pages, with 376 engravings. Cloth, \$4.
- DRUITT (ROBERT).** *THE PRINCIPLES AND PRACTICE OF MODERN SURGERY.* A new American, from the twelfth London edition, edited by STANLEY BOYD, F.R.C.S. Large octavo, 965 pages, with 373 engravings. Cloth, \$4; leather, \$5.
- DUANE (ALEXANDER).** *THE STUDENT'S DICTIONARY OF MEDICINE AND THE ALLIED SCIENCES.* Comprising the Pronunciation, Derivation and Full Explanation of Medical Terms. Together with much Collateral Descriptive Matter, Numerous Tables, etc. New edition. With Appendix. Square octavo volume of 690 pages. Cloth, \$3; half leather, \$3.25; full sheep, \$3.75. Thumb-letter Index, 50 cents extra.
- DUDLEY (E. C.).** *A TREATISE ON THE PRINCIPLES AND PRACTICE OF GYNECOLOGY.* For Students and Practitioners. In one very handsome octavo volume of 652 pages, with 422 engravings, of which 47 are colored, and 2 full page plates in colors and monochrome. Cloth, \$5.00, *net.*; leather, \$6.00, *net.*
- DUNCAN (J. MATTHEWS).** *CLINICAL LECTURES ON THE DISEASES OF WOMEN.* Delivered in St. Bartholomew's Hospital. In one octavo volume of 175 pages. Cloth, \$1.50.
- DUNGLISON (ROBLEY).** *A DICTIONARY OF MEDICAL SCIENCE.* Containing a full Explanation of the Various Subjects and Terms of Anatomy, Physiology, Medical Chemistry, Pharmacy, Pharmacology, Therapeutics, Medicine, Hygiene, Dietetics. Pathology, Surgery, Ophthalmology, Otology, Laryngology, Dermatology, Gynecology, Obstetrics, Pediatrics, Medical Jurisprudence, Dentistry, etc., etc. By ROBLEY DUNGLISON, M.D., LL.D., late Professor of Institutes of Medicine in the Jefferson Medical College of Philadelphia. Edited by RICHARD J. DUNGLISON, A.M., M.D. Twenty-first edition, thoroughly revised and greatly enlarged and improved, with the Pronunciation, Accentuation and Derivation of the Terms. With Appendix. Imperial octavo of 1226 pages. Cloth, \$7; leather, \$8. Thumb-letter Index, 75 cents extra.
- DUNHAM (EDWARD K.).** *MORBID AND NORMAL HISTOLOGY.* Octavo, 460 pages, with 360 illustrations. Cloth, \$3.25, *net.* Just Ready.

- EDS (ROBERT T.).** *TEXT-BOOK OF THERAPEUTICS AND MATERIA MEDICA.* In one 8vo. volume of 544 pages. Cloth, \$3.50; leather, \$4.50.
- EDIS (ARTHUR W.).** *DISEASES OF WOMEN.* A Manual for Students and Practitioners. In one handsome 8vo. volume of 576 pages, with 148 engravings. Cloth, \$3; leather, \$4.
- EGBERT (SENECA).** *HYGIENE AND SANITATION.* In one 12mo. volume of 359 pages, with 63 illustrations. *Just ready.* Cloth, \$2.25, *net.*
- ELLIS (GEORGE VINER).** *DEMONSTRATIONS IN ANATOMY.* Being a Guide to the Knowledge of the Human Body by Dissection. From the eighth and revised English edition. Octavo, 716 pages, with 249 engravings. Cloth, \$4.25; leather, \$5.25.
- EMMET (THOMAS ADDIS).** *THE PRINCIPLES AND PRACTICE OF GYNÆCOLOGY.* For the use of Students and Practitioners. Third edition, enlarged and revised. 8vo. of 880 pages, with 150 original engravings. Cloth, \$5; leather, \$6.
- ERICHSEN (JOHN E.).** *THE SCIENCE AND ART OF SURGERY.* A new American from the eighth enlarged and revised London edition. In two large octavo volumes containing 2316 pages, with 984 engravings. Cloth, \$9; leather, \$11.
- ESSIG (CHARLES J.).** *PROSTHETIC DENTISTRY.* See *American Text-books of Dentistry*, page 2.
- FARQUHARSON (ROBERT).** *A GUIDE TO THERAPEUTICS.* Fourth American from fourth English edition, revised by FRANK WOODBURY, M.D. In one 12mo. volume of 581 pages. Cloth, \$2.50.
- FIELD (GEORGE P.).** *A MANUAL OF DISEASES OF THE EAR.* Fourth edition. Octavo, 391 pages, with 73 engravings and 21 colored plates. Cloth, \$3.75.
- FLINT (AUSTIN).** *A TREATISE ON THE PRINCIPLES AND PRACTICE OF MEDICINE.* New (7th) edition, thoroughly revised by FREDERICK P. HENRY, M.D. In one large 8vo. volume of 1143 pages, with engravings. Cloth, \$5; leather, \$6.
- *A MANUAL OF AUSCULTATION AND PERCUSSION;* of the Physical Diagnosis of Diseases of the Lungs and Heart, and of Thoracic Aneurism. Fifth edition, revised by JAMES C. WILSON, M.D. In one handsome 12mo. volume of 274 pages, with 12 engravings.
- *A PRACTICAL TREATISE ON THE DIAGNOSIS AND TREATMENT OF DISEASES OF THE HEART.* Second edition, enlarged. In one octavo volume of 550 pages. Cloth, \$4.
- *A PRACTICAL TREATISE ON THE PHYSICAL EXPLORATION OF THE CHEST, AND THE DIAGNOSIS OF DISEASES AFFECTING THE RESPIRATORY ORGANS.* Second and revised edition. In one octavo volume of 591 pages. Cloth, \$4.50.
- *MEDICAL ESSAYS.* In one 12mo. volume of 210 pages. Cloth, \$1.38.
- *ON PHTHISIS: ITS MORBID ANATOMY, ETIOLOGY, ETC.* A Series of Clinical Lectures. In one 8vo. volume of 442 pages. Cloth, \$3.50.
- FOLSOM (C. F.).** *AN ABSTRACT OF STATUTES OF U. S. ON CUSTODY OF THE INSANE.* In one 8vo. volume of 108 pages. Cloth, \$1.50. With *Couston on Mental Diseases* (see page 4), at \$5.00, *net*, for the two works.
- FORMULARY, THE NATIONAL.** See *Stillé, Maisch & Caspari's National Dispensatory*, page 14.
- FORMULARY, POCKET.** See page 1.
- FOSTER (MICHAEL).** *A TEXT-BOOK OF PHYSIOLOGY.* New (6th) and revised American from the sixth English edition. In one large octavo volume of 923 pages, with 257 illustrations. Cloth, \$4.50; leather, \$5.50.
- FOTHERGILL (J. MILNER).** *THE PRACTITIONER'S HAND-BOOK OF TREATMENT.* Third edition. In one handsome octavo volume of 664 pages. Cloth, \$3.75; leather, \$4.75.
- FOWNES (GEORGE).** *A MANUAL OF ELEMENTARY CHEMISTRY (IN-ORGANIC AND ORGANIC).* Twelfth edition. Embodying WATTS' *Physical and Inorganic Chemistry.* In one royal 12mo. volume of 1061 pages, with 168 engravings, and 1 colored plate. Cloth, \$2.75; leather, \$3.25.

- FRANKLAND (E.) AND JAPP (F. R.).** *INORGANIC CHEMISTRY.* In one handsome octavo volume of 677 pages, with 51 engravings and 2 plates. Cloth, \$3.75; leather, \$4.75.
- FULLER (EUGENE).** *DISORDERS OF THE SEXUAL ORGANS IN THE MALE.* In one very handsome octavo volume of 238 pages, with 25 engravings and 8 full-page plates. Cloth, \$2.
- FULLER (HENRY).** *ON DISEASES OF THE LUNGS AND AIR-PASSAGES.* Their Pathology, Physical Diagnosis, Symptoms and Treatment. From second English edition. In one 8vo. volume of 475 pages. Cloth, \$3.50.
- GANT (FREDERICK JAMES).** *THE STUDENT'S SURGERY.* A Multum in Parvo. In one square octavo volume of 845 pages, with 159 engravings. Cloth, \$3.75.
- GERRISH (FREDERIC H.).** *A TEXT-BOOK OF ANATOMY.* By American Authors. Edited by FREDERIC H. GERRISH, M.D. In one imp. octavo volume, richly illustrated. *Preparing.*
- GIBBES (HENEAGE).** *PRACTICAL PATHOLOGY AND MORBID HISTOLOGY.* Octavo of 314 pages, with 60 illustrations, mostly photographic. Cloth, \$2.75.
- GIBNEY (V. P.).** *ORTHOPEDIC SURGERY.* For the use of Practitioners and Students. In one 8vo. volume profusely illustrated. *Preparing.*
- GOULD (A. PEARCE).** *SURGICAL DIAGNOSIS.* In one 12mo. volume of 589 pages. Cloth, \$2. See *Students' Series of Manuals*, page 14.
- GRAY (HENRY).** *ANATOMY, DESCRIPTIVE AND SURGICAL.* New American edition of 1897, thoroughly revised. In one imperial octavo volume of 1239 pages, with 772 large and elaborate engravings. Price with illustrations in colors, cloth, \$7; leather, \$8. Price, with illustrations in black, cloth, \$6; leather, \$7.
- GRAY (LONDON CARTER).** *A TREATISE ON NERVOUS AND MENTAL DISEASES.* For Students and Practitioners of Medicine. Second edition. In one handsome octavo volume of 728 pages, with 172 engravings and 3 colored plates. Cloth, \$4.75; leather, \$5.75.
- GREEN (T. HENRY).** *AN INTRODUCTION TO PATHOLOGY AND MORBID ANATOMY.* New (8th) American from eighth and revised English edition. Oct. 595 pages, with 215 engravings and a colored plate. Cloth, \$2.50, *net.* *Just Ready.*
- GREENE (WILLIAM H.).** *A MANUAL OF MEDICAL CHEMISTRY.* For the Use of Students. Based upon *BOWMAN'S Medical Chemistry.* In one 12mo. volume of 310 pages, with 74 illustrations. Cloth, \$1.75.
- GROSS (SAMUEL D.).** *A PRACTICAL TREATISE ON THE DISEASES, INJURIES AND MALFORMATIONS OF THE URINARY BLADDER, THE PROSTATE GLAND AND THE URETHRA.* Third edition, revised by SAMUEL W. GROSS, M.D. Octavo of 574 pages, with 170 illustrations. Cloth, \$4.50.
- HABERSHON (S. O.).** *ON THE DISEASES OF THE ABDOMEN,* comprising those of the Stomach, Oesophagus, Cæcum, Intestines and Peritoneum. Second American from the third English edition. In one octavo volume of 554 pages, with 11 engravings. Cloth, \$3.50.
- HAMILTON (ALLAN McLANE).** *NERVOUS DISEASES, THEIR DESCRIPTION AND TREATMENT.* Second and revised edition. In one octavo volume of 598 pages, with 72 engravings. Cloth, \$4.
- HAMILTON (FRANK H.).** *A PRACTICAL TREATISE ON FRACTURES AND DISLOCATIONS.* Eighth edition, revised and edited by STEPHEN SMITH, A.M., M.D. In one handsome octavo volume of 832 pages, with 507 engravings. Cloth, \$5.50; leather, \$6.50.
- HARDAWAY (W. A.).** *MANUAL OF SKIN DISEASES.* New (2d) edition. In one 12mo. volume, 560 pages with 40 illustrations and 2 colored plates. Cloth, \$2.25, *net.* *Just Ready.*
- HARE (HOBART AMORY).** *A TEXT-BOOK OF PRACTICAL THERAPEUTICS,* with Special Reference to the Application of Remedial Measures to Disease and their Employment upon a Rational Basis. With articles on various subjects by well-known specialists. New (7th) and revised edition. In one octavo volume of 775 pages. Cloth, \$3.75, *net*; leather, \$4.50, *net.*
- *PRACTICAL DIAGNOSIS.* The Use of Symptoms in the Diagnosis of Disease. New (3d) edition, revised and enlarged. In one octavo volume of 615 pages, with 204 engravings, and 13 full-page plates. Cloth, \$4.75, *net.* *Just Ready.*

HARE (HOBART AMORY), Editor. *A SYSTEM OF PRACTICAL THERAPEUTICS.* By American and Foreign Authors. In a series of contributions by eminent practitioners. In four large octavo volumes comprising 4600 pages, with 476 engravings. Vol. IV., *now ready.* Regular price, Vol. IV., cloth, \$6; leather, \$7; half Russia, \$8. Price Vol. IV. to former or new subscribers to complete work, cloth, \$5; leather, \$6; half Russia, \$7. Complete work, cloth, \$20; leather, \$24; half Russia, \$28. *For sale by subscription only.* Full prospectus free on application to the Publishers.

HARTSHORNE (HENRY). *ESSENTIALS OF THE PRINCIPLES AND PRACTICE OF MEDICINE.* Fifth edition. In one 12mo. volume, 669 pages, with 144 engravings. Cloth, \$2.75; half bound, \$3.

— *A HANDBOOK OF ANATOMY AND PHYSIOLOGY.* In one 12mo. volume of 310 pages, with 220 engravings. Cloth, \$1.75.

— *A CONPECTUS OF THE MEDICAL SCIENCES.* Comprising Manuals of Anatomy, Physiology, Chemistry, Materia Medica, Practice of Medicine, Surgery and Obstetrics. Second edition. In one royal 12mo. volume of 1028 pages, with 477 illustrations. Cloth, \$4.25; leather, \$5.

HAYDEN (JAMES E.). *A MANUAL OF VENEREAL DISEASES.* New (2d) edition. In one 12mo. volume of 304 pages, with 54 engravings. *Just ready.* Cloth, \$1.50, *net.*

HAYEM (GEORGES) AND HARE (H. A.). *PHYSICAL AND NATURAL THERAPEUTICS.* The Remedial Use of Heat, Electricity, Modifications of Atmospheric Pressure, Climates and Mineral Waters. Edited by Prof. H. A. HARE, M.D. In one octavo volume of 414 pages, with 113 engravings. Cloth, \$3.

HERMAN (G. ERNEST). *FIRST LINES IN MIDWIFERY.* 12mo., 198 pages, with 80 engravings. Cloth, \$1.25. See *Students' Series of Manuals*, page 14.

HERMANN (L.). *EXPERIMENTAL PHARMACOLOGY.* A Handbook of the Methods for Determining the Physiological Actions of Drugs. Translated by ROBERT MEADE SMITH, M.D. In one 12mo. vol. of 199 pages, with 32 engravings. Cloth, \$1.50.

HERRICK (JAMES B.). *A HANDBOOK OF DIAGNOSIS.* In one handsome 12mo. volume of 429 pages, with 80 engravings and 2 colored plates. Cloth, \$2.50.

HILL (BERKELEY). *SYPHILIS AND LOCAL CONTAGIOUS DISORDERS.* In one 8vo. volume of 479 pages. Cloth, \$3.25.

HILLIER (THOMAS). *A HANDBOOK OF SKIN DISEASES.* Second edition. In one royal 12mo. volume of 353 pages, with two plates. Cloth, \$2.25.

HIRST (BARTON C.) AND PIERSOL (GEORGE A.). *HUMAN MONSTROSITIES.* Magnificent folio, containing 220 pages of text and illustrated with 123 engravings and 39 large photographic plates from nature. In four parts, price each, \$5. *Limited edition. For sale by subscription only.*

HOBLYN (RICHARD D.). *A DICTIONARY OF THE TERMS USED IN MEDICINE AND THE COLLATERAL SCIENCES.* In one 12mo. volume of 520 double-columned pages. Cloth, \$1.50; leather, \$2.

HODGE (HUGH L.). *ON DISEASES PECULIAR TO WOMEN, INCLUDING DISPLACEMENTS OF THE UTERUS.* Second and revised edition. In one 8vo. volume of 519 pages, with illustrations. Cloth, \$4.50.

HOFFMANN (FREDERICK) AND POWER (FREDERICK B.). *A MANUAL OF CHEMICAL ANALYSIS,* as Applied to the Examination of Medicinal Chemicals and their Preparations. Third edition, entirely rewritten and much enlarged. In one handsome octavo volume of 621 pages, with 179 engravings. Cloth, \$4.25.

HOLDEN (LUTHER). *LANDMARKS, MEDICAL AND SURGICAL.* From the third English edition. With additions by W. W. KEEN, M.D. In one royal 12mo. volume of 148 pages. Cloth, \$1.

HOLMES (TIMOTHY). *A TREATISE ON SURGERY.* Its Principles and Practice. A new American from the fifth English edition. Edited by T. PICKERING PRICK, F.R.C.S. In one handsome octavo volume of 1008 pages, with 428 engravings. Cloth, \$6; leather, \$7.

— *A SYSTEM OF SURGERY.* With notes and additions by various American authors. Edited by JOHN H. PACKARD, M.D. In three very handsome 8vo. volumes containing 3137 double-columned pages, with 979 engravings and 13 lithographic plates. Per volume, cloth, \$6; leather, \$7; half Russia, \$7.50. *For sale by subscription only.*

- HORNER (WILLIAM E.).** *SPECIAL ANATOMY AND HISTOLOGY.* Eighth edition, revised and modified. In two large 8vo. volumes of 1007 pages, containing 320 engravings. Cloth, \$6.
- HUDSON (A.).** *LECTURES ON THE STUDY OF FEVER.* In one octavo volume of 308 pages. Cloth, \$2.50.
- HUTCHISON (ROBERT) AND RAINY (HARRY).** *CLINICAL METHODS.* An Introduction to the Practical Study of Medicine. In one 12mo. volume of 562 pages, with 137 engravings and 8 colored plates. Cloth, \$3.00. *Just ready.*
- HUTCHINSON (JONATHAN).** *SYPHILIS.* 12mo., 542 pages, with 8 chromo-lithographic plates. Cloth, \$2.25. See *Series of Clinical Manuals*, page 13.
- HYDE (JAMES NEVINS).** *A PRACTICAL TREATISE ON DISEASES OF THE SKIN.* New (4th) edition, thoroughly revised. Octavo, 815 pages, with 110 engravings and 12 full-page plates, 4 of which are colored. Cloth, \$5.25; leather, \$6.25.
- JACKSON (GEORGE THOMAS).** *THE READY-REFERENCE HANDBOOK OF DISEASES OF THE SKIN.* New (3d) edition. *In press.* 12mo. volume of 600 pages, with 73 engravings, and one colored plate.
- JAMIESON (W. ALLAN).** *DISEASES OF THE SKIN.* Third edition. Octavo, 656 pages, with 1 engraving and 9 double-page chromo-lithographic plates. Cloth, \$6.
- JEWETT (CHARLES).** *ESSENTIALS OF OBSTETRICS.* In one 12mo. volume of 356 pages, with 80 engravings and 3 colored plates. Cloth, \$2.25. *Just ready.*
- *THE PRACTICE OF OBSTETRICS.* By American Authors. One large octavo volume of 763 pages, with 441 engravings in black and colors, and 22 full-page colored plates. *Just ready.* Cloth, \$5.00, *net*; Leather, \$6.00, *net*.
- JONES (C. HANDFIELD).** *CLINICAL OBSERVATIONS ON FUNCTIONAL NERVOUS DISORDERS.* Second American edition. In one octavo volume of 340 pages. Cloth, \$3.25.
- JULER (HENRY).** *A HANDBOOK OF OPHTHALMIC SCIENCE AND PRACTICE.* Second edition. In one octavo volume of 549 pages, with 201 engravings, 17 chromo-lithographic plates, test-types of Jaeger and Snellen, and Holmgren's Color-Blindness Test. Cloth, \$5.50; leather, \$6.50.
- KIRK (EDWARD C.).** *OPERATIVE DENTISTRY.* See *American Text-books of Dentistry*, page 2.
- KING (A. F. A.).** *A MANUAL OF OBSTETRICS.* Seventh edition. In one 12mo. volume of 573 pages, with 223 illustrations. Cloth, \$2.50.
- KLEIN (E.).** *ELEMENTS OF HISTOLOGY.* New (5th) edition. In one pocket-size 12mo. volume of 506 pages, with 296 engravings. Cloth, \$2.00, *net*. *Just Ready.* See *Students' Series of Manuals*, page 14.
- LANDIS (HENRY G.).** *THE MANAGEMENT OF LABOR.* In one handsome 12mo. volume of 329 pages, with 28 illustrations. Cloth, \$1.75.
- LA ROCHE (R.).** *YELLOW FEVER.* In two 8vo. volumes of 1468 pages. Cloth, \$7.
- *PNEUMONIA.* In one 8vo. volume of 490 pages. Cloth, \$3.
- LAURENCE (J. Z.) AND MOON (ROBERT C.).** *A HANDY-BOOK OF OPHTHALMIC SURGERY.* Second edition. In one octavo volume of 227 pages, with 66 engravings. Cloth, \$2.75.
- LEA (HENRY C.).** *CHAPTERS FROM THE RELIGIOUS HISTORY OF SPAIN; CENSORSHIP OF THE PRESS; MYSTICS AND ILLUMINATI; THE ENDEMONIADAS; EL SANTO NINO DE LA GUARDIA; BRIANDA DE BARDAXI.* In one 12mo. volume of 522 pages. Cloth, \$2.50.
- *A HISTORY OF AURICULAR CONFESSION AND INDULGENCES IN THE LATIN CHURCH.* In three octavo volumes of about 500 pages each. Per volume, cloth, \$3. *Complete work just ready.*
- *FORMULARY OF THE PAPAL PENITENTIARY.* In one octavo volume of 221 pages, with frontispiece. Cloth, \$2.50.

LEA (HENRY C.). *STUDIES IN CHURCH HISTORY.* The Rise of the Temporal Power—Benefit of Clergy—Excommunication. New edition. In one handsome 12mo. volume of 605 pages. Cloth, \$2.50.

— *SUPERSTITION AND FORCE; ESSAYS ON THE WAGER OF LAW, THE WAGER OF BATTLE, THE ORDEAL AND TORTURE.* Fourth edition, thoroughly revised. In one handsome royal 12mo. volume of 629 pages. Cloth, \$2.75.

— *AN HISTORICAL SKETCH OF SACERDOTAL CELIBACY IN THE CHRISTIAN CHURCH.* Second edition. In one handsome octavo volume of 685 pages. Cloth, \$4.50.

LEE (HENRY) *ON SYPHILIS.* In one 8vo. volume of 246 pages. Cloth, \$2.25.

LEHMANN (C. G.). *A MANUAL OF CHEMICAL PHYSIOLOGY.* In one 8vo. volume of 327 pages, with 41 engravings. Cloth, \$2.25.

LOOMIS (ALFRED L.) AND THOMPSON (W. GILMAN), Editors. *A SYSTEM OF PRACTICAL MEDICINE.* In Contributions by Various American Authors. In four very handsome octavo volumes of about 900 pages each, fully illustrated in black and colors. *Complete work just ready.* Per volume, cloth, \$5; leather, \$6; half Morocco, \$7. *For sale by subscription only.* Full prospectus free on application to the Publishers.

LUFF (ARTHUR P.). *MANUAL OF CHEMISTRY,* for the use of Students of Medicine. In one 12mo. volume of 522 pages, with 36 engravings. Cloth, \$2. See *Students' Series of Manuals*, page 14

LYMAN (HENRY M.). *THE PRACTICE OF MEDICINE* In one very handsome octavo volume of 925 pages with 170 engravings. Cloth, \$4.75; leather, \$5.75.

LYONS (ROBERT D.). *A TREATISE ON FEVER.* In one octavo volume of 362 pages. Cloth, \$2.25.

MACKENZIE (JOHN NOLAND). *THE DISEASES OF THE NOSE AND THROAT.* In one handsome octavo volume of about 600 pages, richly illustrated. *Preparing.*

MAISCH (JOHN M.). *A MANUAL OF ORGANIC MATERIA MEDICA.* Sixth edition, thoroughly revised by H. C. C. MAISCH, Ph.G., Ph.D. In one very handsome 12mo. volume of 509 pages, with 285 engravings. Cloth, \$3.

MANUALS. See *Students' Quiz Series*, page 14, *Students' Series of Manuals*, page 14, and *Series of Clinical Manuals*, page 13.

MARSH (HOWARD). *DISEASES OF THE JOINTS.* In one 12mo. volume of 468 pages, with 64 engravings and a colored plate. Cloth, \$2. See *Series of Clinical Manuals*, page 13.

MAY (C. H.). *MANUAL OF THE DISEASES OF WOMEN.* For the use of Students and Practitioners. Second edition, revised by L. S. RAU, M.D. In one 12mo. volume of 360 pages, with 31 engravings. Cloth, \$1.75.

MEDICAL NEWS POCKET FORMULARY. See page 1.

MITCHELL (JOHN K.). *REMOTE CONSEQUENCES OF INJURIES OF NERVES AND THEIR TREATMENT.* In one handsome 12mo. volume of 239 pages, with 12 illustrations. Cloth \$1.75.

MITCHELL (S. WEIR). *CLINICAL LESSONS ON NERVOUS DISEASES.* In one very handsome 12mo. volume of 299 pages, with 17 engravings and 2 colored plates. Cloth, \$2.50. Of the one hundred numbered copies with the Author's signed title page a few remain; these are offered in green cloth, gilt top, at \$3.50, *net*.

MORRIS (HENRY). *SURGICAL DISEASES OF THE KIDNEY.* In one 12mo. volume of 554 pages, with 40 engravings and 6 colored plates. Cloth, \$2.25. See *Series of Clinical Manuals*, page 13.

MORRIS (MALCOLM). *DISEASES OF THE SKIN.* New (2d) edition. In one 12mo. volume of 601 pages, with 10 chromo-lithographic plates and 26 engravings. *Just ready.* Cloth, \$3.25, *net*.

MULLER (J.). *PRINCIPLES OF PHYSICS AND METEOROLOGY.* In one large 8vo. volume of 623 pages, with 538 engravings. Cloth, \$4.50.

MUSSER (JOHN H.). *A PRACTICAL TREATISE ON MEDICAL DIAGNOSIS,* for Students and Physicians. New (2d) edition. In one octavo volume of 981 pages, illustrated with 177 engravings and 11 full-page colored plates. Cloth, \$5; leather, \$6.

NATIONAL DISPENSATORY. See *Stillé, Maisch & Caspari*, page 14.

NATIONAL FORMULARY. See *Stillé, Maisch & Caspari's National Dispensatory*, page 14.

NATIONAL MEDICAL DICTIONARY. See *Billings*, page 3.

NETTLESHIP (E.). *DISEASES OF THE EYE.* New (5th) American from sixth English edition. Thoroughly revised. In one 12mo. volume of 521 pages, with 161 engravings, 2 colored plates, test-types, formulæ and color-blindness test. Cloth, \$2.25. *Just ready.*

NORRIS (WM. F.) AND OLIVER (CHAS. A.). *TEXT-BOOK OF OPHTHALMOLOGY.* In one octavo volume of 641 pages, with 357 engravings and 5 colored plates. Cloth, \$5; leather, \$6.

OWEN (EDMUND). *SURGICAL DISEASES OF CHILDREN.* In one 12mo. volume of 525 pages, with 85 engravings and 4 colored plates. Cloth, \$2. See *Series of Clinical Manuals*, page 13.

PARK (BOSWELL), Editor. *A TREATISE ON SURGERY,* by American Authors. For Students and Practitioners of Surgery and Medicine. In two magnificent octavo volumes. Vol. I., *General Surgery*, 799 pages, with 356 engravings and 21 full-page plates in colors and monochrome. Vol. II., *Special Surgery*, 796 pages, with 451 engravings and 17 full-page plates in colors and monochrome. *Complete work now ready.* Price per volume, cloth, \$4.50; leather, \$5.50. *Net*.

PARRY (JOHN S.). *EXTRA-UTERINE PREGNANCY, ITS CLINICAL HISTORY, DIAGNOSIS, PROGNOSIS AND TREATMENT.* In one octavo volume of 272 pages. Cloth, \$2.50.

PARVIN (THEOPHILUS). *THE SCIENCE AND ART OF OBSTETRICS.* Third edition. In one handsome octavo volume of 677 pages, with 267 engravings and 2 colored plates. Cloth, \$4.25; leather, \$5 25.

PAYNE (JOSEPH FRANK). *A MANUAL OF GENERAL PATHOLOGY.* Designed as an Introduction to the Practice of Medicine. In one octavo volume of 524 pages, with 153 engravings and 1 colored plate.

PEPPER'S SYSTEM OF MEDICINE. See page 2.

PEPPER (A. J.). *SURGICAL PATHOLOGY.* In one 12mo volume of 511 pages, with 81 engravings. Cloth, \$2. See *Students' Series of Manuals*, page 14.

PICK (T. PICKERING). *FRACTURES AND DISLOCATIONS.* In one 12mo. volume of 530 pages, with 93 engravings. Cloth, \$2. See *Series of Clinical Manuals*, p. 13.

PLAYFAIR (W. S.). *A TREATISE ON THE SCIENCE AND PRACTICE OF MIDWIFERY.* New (7th) American from the Ninth English edition. In one octavo volume of 700 pages, with 207 engravings and 7 full page plates. Cloth, \$3.75, *net*; leather, \$4.75, *net.* *Just Ready.*

— *THE SYSTEMATIC TREATMENT OF NERVE PROSTRATION AND HYSTERIA.* In one 12mo. volume of 97 pages. Cloth, \$1.

POCKET FORMULARY. See page 1.

POLITZER (ADAM). *A TEXT-BOOK OF THE DISEASES OF THE EAR AND ADJACENT ORGANS.* Second American from the third German edition. Translated by OSCAR DODD, M.D., and edited by SIR WILLIAM DALBY, F.R.C.S. In one octavo volume of 748 pages, with 330 original engravings.

POWER (HENRY). *HUMAN PHYSIOLOGY.* Second edition. In one 12mo. volume of 396 pages, with 47 engravings. Cloth, \$1.50. See *Students' Series of Manuals*, page 14.

PROGRESSIVE MEDICINE. See page 1.

PURDY (CHARLES W.). *BRIGHT'S DISEASE AND ALLIED AFFECTIONS OF THE KIDNEY.* In one octavo volume of 288 pages, with 18 engravings. Cloth, \$2.

PYE-SMITH (PHILIP H.). *DISEASES OF THE SKIN.* In one 12mo. volume of 407 pages, with 28 illustrations, 18 of which are colored. Cloth, \$2.

QUIZ SERIES. See *Students' Quiz Series*, page 14.

RALFE (CHARLES H.). *CLINICAL CHEMISTRY.* In one 12mo. volume of 314 pages, with 16 engravings. Cloth, \$1.50. See *Students' Series of Manuals*, page 14.

RAMSBOTHAM (FRANCIS H.). *THE PRINCIPLES AND PRACTICE OF OBSTETRIC MEDICINE AND SURGERY.* In one imperial octavo volume of 640 pages, with 64 plates and numerous engravings in the text. Strongly bound in leather, \$7.

REICHERT (EDWARD T.). *A TEXT-BOOK ON PHYSIOLOGY.* In one handsome octavo volume of about 800 pages, richly illustrated. *Preparing.*

REMSEN (IRA). *THE PRINCIPLES OF THEORETICAL CHEMISTRY.* New (5th) edition, thoroughly revised. In one 12mo. volume of 326 pages. Cloth, \$2

RICHARDSON (BENJAMIN WARD). *PREVENTIVE MEDICINE.* In one octavo volume of 729 pages. Cloth, \$4; leather, \$5.

ROBERTS (JOHN B.). *THE PRINCIPLES AND PRACTICE OF MODERN SURGERY.* In one octavo volume of 780 pages, with 501 engravings. Cloth, \$4.50; leather, \$5.50.

— *THE COMPEND OF ANATOMY.* For use in the Dissecting Room and in preparing for Examinations. In one 16mo. volume of 196 pages. Limp cloth, 75 cents.

ROBERTS (SIR WILLIAM). *A PRACTICAL TREATISE ON URINARY AND RENAL DISEASES, INCLUDING URINARY DEPOSITS.* Fourth American from the fourth London edition. In one very handsome 8vo. volume of 609 pages, with 81 illustrations. Cloth, \$3.50.

ROBERTSON (J. MCGREGOR). *PHYSIOLOGICAL PHYSICS.* In one 12mo volume of 537 pages, with 219 engravings. Cloth, \$2. See *Students' Series of Manuals*, page 14.

ROSS (JAMES). *A HANDBOOK OF THE DISEASES OF THE NERVOUS SYSTEM.* In one handsome octavo volume of 726 pages, with 184 engravings. Cloth, \$4.50; leather, \$5.50

SAVAGE (GEORGE H.). *INSANITY AND ALLIED NEUROSES, PRACTICAL AND CLINICAL.* New (2d) and enlarged edition. In one 12mo. volume of 551 pages, with 18 typical engravings. Cloth, \$2. See *Series of Clinical Manuals*, page 13.

SCHAFER (EDWARD A.). *THE ESSENTIALS OF HISTOLOGY, DESCRIPTIVE AND PRACTICAL.* For the use of Students. New (5th) edition. In one handsome octavo volume of 350 pages, with 325 illustrations. Cloth, \$3, *net.* Just ready.

— *A COURSE OF PRACTICAL HISTOLOGY.* New (2d) edition. In one 12mo. volume of 307 pages, with 59 engravings. Cloth, \$2.25.

SCHMITZ AND ZUMPT'S CLASSICAL SERIES.**ADVANCED LATIN EXERCISES** Cloth, 60 cents; half bound, 70 cents.**SCHMITZ'S ELEMENTARY LATIN EXERCISES.** Cloth, 50 cents.**SALLUST.** Cloth, 60 cents; half bound, 70 cents.**NEPOS.** Cloth, 60 cents; half bound, 70 cents.**VIRGIL.** Cloth, 85 cents; half bound, \$1.**CURTIUS.** Cloth, 80 cents; half bound, 90 cents.**SCHOFIELD (ALFRED T.). ELEMENTARY PHYSIOLOGY FOR STUDENTS.** In one 12mo. volume of 380 pages, with 227 engravings and 2 colored plates. Cloth, \$2.**SCHREIBER (JOSEPH). A MANUAL OF TREATMENT BY MASSAGE AND METHODOICAL MUSCLE EXERCISE.** Translated by WALTER MENDELSON, M.D., of New York. In one handsome octavo volume of 274 pages, with 117 fine engravings.**SENN (NICHOLAS). SURGICAL BACTERIOLOGY.** Second edition. In one octavo volume of 268 pages, with 13 plates, 10 of which are colored, and 9 engravings. Cloth, \$2.**SERIES OF CLINICAL MANUALS.** A Series of Authoritative Monographs on Important Clinical Subjects, in 12mo. volumes of about 550 pages, well illustrated. The following volumes are now ready: BROADBENT on the Pulse, \$1.75; YEO on Food in Health and Disease, new (2d) edition, \$2.50; CARTER and FROST's Ophthalmic Surgery, \$2.25; HUTCHINSON on Syphilis, \$2.25; MARSH on Diseases of the Joints, \$2; MORRIS on Surgical Diseases of the Kidney, \$2.25; OWEN on Surgical Diseases of Children, \$2; PICK on Fractures and Dislocations, \$2; BUTLIN on the Tongue, \$3.50; SAVAGE on Insanity and Allied Neuroses, \$2; and TREVES on Intestinal Obstruction, \$2.

For separate notices, see under various authors' names.

SERIES OF STUDENTS' MANUALS. See next page.**SIMON (CHARLES E.). CLINICAL DIAGNOSIS, BY MICROSCOPICAL AND CHEMICAL METHODS.** New (2d) and revised edition. In one handsome octavo volume of 530 pages, with 135 engravings and 14 full-page plates in colors and monochrome. Cloth, \$3.50.**SIMON (W.). MANUAL OF CHEMISTRY.** A Guide to Lectures and Laboratory Work for Beginners in Chemistry. A Text-book specially adapted for Students of Pharmacy and Medicine. New (6th) edition. In one 8vo. volume of 536 pages, with 46 engravings and 8 plates showing colors of 64 tests. Cloth, \$3.00, *net*. Just Ready.**SLADE (D. D.). DIPHTHERIA; ITS NATURE AND TREATMENT.** Second edition. In one royal 12mo. volume, 158 pages. Cloth, \$1.25.**SMITH (EDWARD). CONSUMPTION; ITS EARLY AND REMEDIABLE STAGES.** In one 8vo. volume of 253 pages. Cloth, \$2.25.**SMITH (J. LEWIS). A TREATISE ON THE DISEASES OF INFANCY AND CHILDHOOD.** New (8th) edition, thoroughly revised and rewritten and greatly enlarged. In one large 8vo. volume of 983 pages, with 273 illustrations and 4 full-page plates. Cloth, \$4.50; leather, \$5.50.**SMITH (STEPHEN). OPERATIVE SURGERY.** Second and thoroughly revised edition. In one octavo vol. of 892 pages, with 1005 engravings. Cloth, \$4; leather, \$5.**SOLLY (S. EDWIN). A HANDBOOK OF MEDICAL CLIMATOLOGY.** In one handsome octavo volume of 462 pages, with engravings and 11 full-page plates, 5 of which are in colors. Cloth, \$4.00.**STILLE (ALFRED). CHOLERA; ITS ORIGIN, HISTORY, CAUSATION, SYMPTOMS, LESIONS, PREVENTION AND TREATMENT.** In one 12mo. volume of 163 pages, with a chart showing routes of previous epidemics. Cloth, \$1.25.**— THERAPEUTICS AND MATERIA MEDICA.** Fourth and revised edition. In two octavo volumes, containing 1936 pages. Cloth, \$10; leather, \$12.

STILLE (ALFRED), MAISOH (JOHN M.) AND CASPARI (CHAS. JR.). *THE NATIONAL DISPENSATORY*: Containing the Natural History, Chemistry, Pharmacy, Actions and Uses of Medicines, including those recognized in the latest Pharmacopœias of the United States, Great Britain and Germany, with numerous references to the French Codex. Fifth edition, revised and enlarged in accordance with and embracing the new *U. S. Pharmacopœia*, Seventh Decennial Revision. With Supplement containing the new edition of the *National Formulary*. In one magnificent imperial octavo volume of 2025 pages, with 320 engravings. Cloth, \$7.25; leather, \$8. With ready reference Thumb-letter Index. Cloth, \$7.75; leather, \$8.50.

STIMSON (LEWIS A.). *A MANUAL OF OPERATIVE SURGERY*. New (3d) edition. In one royal 12mo. volume of 614 pages, with 306 engravings. Cloth, \$3.75.

— *A TREATISE ON FRACTURES AND DISLOCATIONS*. In two handsome octavo volumes. Vol. I., *FRACTURES*, 582 pages, 360 engravings. Vol. II., *DISLOCATIONS*, 540 pages, 163 engravings. Complete work, cloth, \$5.50; leather, \$7.50. Either volume separately, cloth, \$3; leather, \$4.

STUDENTS' QUIZ SERIES. A New Series of Manuals in question and answer for Students and Practitioners, covering the essentials of medical science. Thirteen volumes, pocket size, convenient, authoritative, well illustrated, handsomely bound in limp cloth, and issued at a low price. 1. *Anatomy* (double number); 2. *Physiology*; 3. *Chemistry and Physics*; 4. *Histology, Pathology and Bacteriology*; 5. *Materia Medica and Therapeutics*; 6. *Practice of Medicine*; 7. *Surgery* (double number); 8. *Genito-Urinary and Venereal Diseases*; 9. *Diseases of the Skin*; 10. *Diseases of the Eye, Ear, Throat and Nose*; 11. *Obstetrics*; 12. *Gynecology*; 13. *Diseases of Children*. Price, \$1 each, except Nos. 1 and 7, *Anatomy and Surgery*, which being double numbers are priced at \$1.75 each. Full specimen circular on application to publishers.

STUDENTS' SERIES OF MANUALS. A Series of Fifteen Manuals by Eminent Teachers or Examiners. The volumes are pocket-size 12mos. of from 300–540 pages, profusely illustrated, and bound in red limp cloth. The following volumes may now be announced: *HERMAN's First Lines in Midwifery*, \$1.25; *LUFF's Manual of Chemistry*, \$2; *BRUCE's Materia Medica and Therapeutics* (sixth edition), *shortly*; *BELL's Comparative Anatomy and Physiology*, \$2; *ROBERTSON's Physiological Physics*, \$2; *GOULD's Surgical Diagnosis*, \$2; *KLEIN's Elements of Histology* (5th edition), \$2.00, *net*; *PEPPER's Surgical Pathology*, \$2; *TREVES' Surgical Applied Anatomy*, \$2; *POWER's Human Physiology* (2d edition), \$1.50; *RALFE's Clinical Chemistry*, \$1.50; and *CLARKE and LOCKWOOD's Dissector's Manual*, \$1.50.

For separate notices, see under various authors' names.

STURGES (OCTAVIUS). *AN INTRODUCTION TO THE STUDY OF CLINICAL MEDICINE*. In one 12mo. volume. Cloth, \$1.25.

SUTTON (JOHN BLAND). *SURGICAL DISEASES OF THE OVARIES AND FALLOPIAN TUBES*. Including Abdominal Pregnancy. In one 12mo. volume of 513 pages, with 119 engravings and 5 colored plates. Cloth, \$3.

— *TUMORS, INNOCENT AND MALIGNANT*. Their Clinical Features and Appropriate Treatment. In one 8vo. volume of 526 pages, with 250 engravings and 9 full-page plates. Cloth, \$4.50.

TAIT (LAWSON). *DISEASES OF WOMEN AND ABDOMINAL SURGERY*. In two handsome octavo volumes. Vol. I. contains 554 pages, 62 engravings, and 3 plates. Cloth, \$3. Vol. II., *preparing*.

TANNER (THOMAS HAWKES). *ON THE SIGNS AND DISEASES OF PREGNANCY*. From the second English edition. In one octavo volume of 490 pages, with 4 colored plates and 16 engravings. Cloth, \$4.25.

TAYLOR (ALFRED S.). *MEDICAL JURISPRUDENCE*. New American from the twelfth English edition, specially revised by CLARK BELL, Esq., of the N. Y. Bar. In one octavo volume of 331 pages, with 54 engravings and 8 full-page plates. Cloth, \$4.50; leather, \$5.50. *Just ready*.

TAYLOR (ALFRED S.). *ON POISONS IN RELATION TO MEDICINE AND MEDICAL JURISPRUDENCE.* Third American from the third London edition. In one 8vo. volume of 788 pages, with 104 illustrations. Cloth, \$5.50; leather, \$6.50.

TAYLOR (ROBERT W.). *THE PATHOLOGY AND TREATMENT OF VENEREAL DISEASES.* In one very handsome octavo volume of 1002 pages, with 230 engravings and 7 colored plates. Cloth, \$5; leather, \$6. *Net.*

— *A PRACTICAL TREATISE ON SEXUAL DISORDERS IN THE MALE AND FEMALE.* In one octavo volume of 448 pages, with 73 engravings and 8 plates. Cloth, \$3. *Net. Just ready.*

— *A CLINICAL ATLAS OF VENEREAL AND SKIN DISEASES.* Including Diagnosis, Prognosis and Treatment. In eight large folio parts, measuring 14 x 18 inches, and comprising 213 beautiful figures on 58 full-page chromo-lithographic plates, 85 fine engravings, and 425 pages of text. Complete work now ready. Price per part, sewed in heavy embossed paper, \$2.50. Bound in one volume, half Russia, \$27; half Turkey Morocco, \$28. *For sale by subscription only.* Address the publishers. Specimen plates by mail on receipt of 10 cents.

TAYLOR (SEYMOUR). *INDEX OF MEDICINE.* A Manual for the use of Senior Students and others. In one large 12mo. volume of 802 pages. Cloth, \$3.75.

THOMAS (T. GAILLARD) AND MUNDE (PAUL F.). *A PRACTICAL TREATISE ON THE DISEASES OF WOMEN.* Sixth edition, thoroughly revised by PAUL F. MUNDE, M.D. In one large and handsome octavo volume of 824 pages, with 347 engravings. Cloth, \$5; leather, \$6.

THOMPSON (SIR HENRY). *CLINICAL LECTURES ON DISEASES OF THE URINARY ORGANS.* Second and revised edition. In one octavo volume of 203 pages, with 25 engravings. Cloth, \$2.25.

— *THE PATHOLOGY AND TREATMENT OF STRICTURE OF THE URETHRA AND URINARY FISTULÆ.* From the third English edition. In one octavo volume of 359 pages, with 47 engravings and 3 lithographic plates. Cloth, \$3.50.

THOMSON (JOHN). *A GUIDE TO THE CLINICAL EXAMINATION AND TREATMENT OF SICK CHILDREN.* In one crown octavo volume of 350 pages with 52 illustrations. Cloth, \$1.75, *net. Just ready.*

TODD (ROBERT BENTLEY). *CLINICAL LECTURES ON CERTAIN ACUTE DISEASES.* In one 8vo. volume of 320 pages. Cloth, \$2.50.

TREVES (FREDERICK). *OPERATIVE SURGERY.* In two 8vo. volumes containing 1550 pages, with 422 illustrations. Cloth, \$9; leather, \$11.

— *A SYSTEM OF SURGERY.* In Contributions by Twenty-five English Surgeons. In two large octavo volumes, containing 2298 pages, with 950 engravings and 4 full-page plates. Per volume, cloth, \$8.

— *A MANUAL OF SURGERY.* In Treatises by 33 leading surgeons. Three 12mo. volumes, containing 1866 pages, with 213 engravings. Price per set, \$6. See *Students' Series of Manuals*, page 14.

— *THE STUDENTS' HANDBOOK OF SURGICAL OPERATIONS.* In one 12mo. volume of 508 pages, with 94 illustrations. Cloth, \$2.50.

— *SURGICAL APPLIED ANATOMY.* In one 12mo. volume of 583 pages with 61 engravings. Cloth, \$2. See *Students' Series of Manuals*, page 14.

— *INTESTINAL OBSTRUCTION.* In one 12mo. volume of 522 pages, with 60 illustrations. Cloth, \$2. See *Series of Clinical Manuals*, page 13.

TOKE (DANIEL HACK). *THE INFLUENCE OF THE MIND UPON THE BODY IN HEALTH AND DISEASE.* Second edition. In one 8vo. volume of 467 pages, with 2 colored plates. Cloth, \$3.

VAUGHAN (VICTOR C.) AND NOVY (FREDERICK G.). *PTOMAINS, LEUCOMAINS, TOXINS AND ANTITOXINS, or the Chemical Factors in the Causation of Disease.* Third edition. In one 12mo. volume of 603 pages. Cloth, \$3.

VISITING LIST. THE MEDICAL NEWS VISITING LIST for 1899. Four styles: Weekly (dated for 30 patients); Monthly (undated for 120 patients per month); Perpetual (undated for 30 patients each week); and Perpetual (undated for 60 patients each week). The 60-patient book consists of 256 pages of assorted blanks. The first three styles contain 32 pages of important data, thoroughly revised, and 160 pages of assorted blanks. Each in one volume, price, \$1.25. With thumb-letter index for quick use, 25 cents extra. Special rates to advance-paying subscribers to *THE MEDICAL NEWS* or *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, or both. See page 1.

WATSON (THOMAS). LECTURES ON THE PRINCIPLES AND PRACTICE OF PHYSIC. A new American from the fifth and enlarged English edition, with additions by H. HARTSHORNE, M.D. In two large 8vo. volumes of 1840 pages, with 190 engravings. Cloth, \$9; leather, \$11.

WEST (CHARLES). LECTURES ON THE DISEASES PECULIAR TO WOMEN. Third American from the third English edition. In one octavo volume of 543 pages. Cloth, \$3 75; leather, \$4.75.

— **ON SOME DISORDERS OF THE NERVOUS SYSTEM IN CHILDHOOD.** In one small 12mo. volume of 127 pages. Cloth, \$1.

WHARTON (HENRY R.). MINOR SURGERY AND BANDAGING. Third edition. In one 12mo volume of 594 pages, with 475 engravings, many of which are photographic. Cloth, \$3.

WHITLA (WILLIAM). DICTIONARY OF TREATMENT, OR THERAPEUTIC INDEX. Including Medical and Surgical Therapeutics. In one square octavo volume of 917 pages. Cloth, \$4.

WILLIAMS (DAWSON). MEDICAL DISEASES OF INFANCY AND CHILDHOOD. In one 12mo. volume of 629 pages, with 18 illustrations. Cloth, \$2.50, *net*. Just ready.

WILSON (ERASMUS). A SYSTEM OF HUMAN ANATOMY. A new and revised American from the last English edition. Illustrated with 397 engravings. In one octavo volume of 616 pages. Cloth, \$4; leather, \$5.

— **THE STUDENT'S BOOK OF CUTANEOUS MEDICINE** In one 12mo volume. Cloth, \$3 50.

WINCKEL ON PATHOLOGY AND TREATMENT OF CHILDREN. Translated by JAMES R. CHADWICK, A.M., M.D. With additions by the Author. In one octavo volume of 484 pages. Cloth, \$4.

WÖHLER'S OUTLINES OF ORGANIC CHEMISTRY Translated from the eighth German edition, by IRA REMSEN, M.D. In one 12mo. volume of 550 pages. Cloth \$3

YEAR BOOK OF TREATMENT FOR 1899. A Critical Review for Practitioners of Medicine and Surgery. In contributions by 24 well-known medical writers. 12mo., 488 pages. Cloth, \$1 50. *Shortly*.

YEAR-BOOKS OF TREATMENT for 1892, 1893, 1896, 1897 and 1898, similar to above. Each, cloth, \$1.50

YEO (I. BURNEY). FOOD IN HEALTH AND DISEASE. New (2d) edition. In one 12mo. volume of 592 pages, with 4 engravings. Cloth, \$2.50. See *Series of Clinical Manuals*, page 13

— **A MANUAL OF MEDICAL TREATMENT, OR CLINICAL THERAPEUTICS.** Two volumes containing 1275 pages. Cloth, \$5.50

YOUNG (JAMES K.). ORTHOPEDIC SURGERY. In one 8vo. volume of 475 pages, with 286 illustrations. Cloth, \$4; leather, \$5.



MAR 26 1903

